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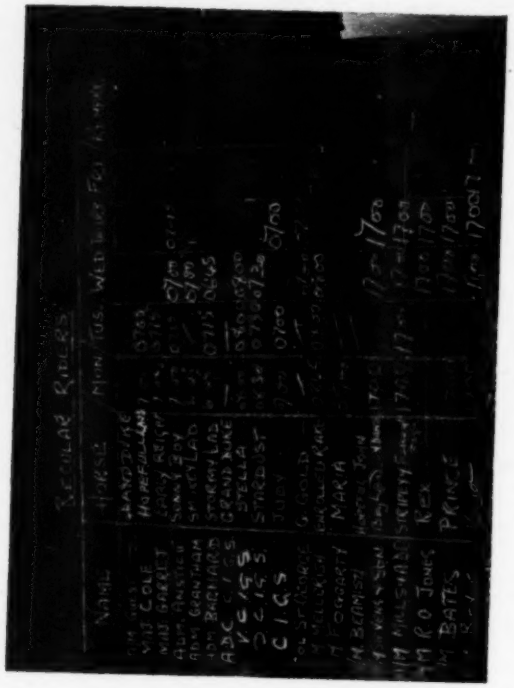
The Coronation

AFTER months of rejoicing Her Majesty, Queen Elizabeth II, is about to attain the chair of King Edward and to dedicate herself to the service of her peoples. All the wealth of devotion that is hers by inheritance from her father and grandfather and by right of the affection she herself has won, is heightened for members of the veterinary profession by the personal interest in our affairs manifested by generations of members of the ruling house and most notably in the opening of the re-built Royal Veterinary College and Hospital by King George VI and his Queen in 1937. By early bestowal of her patronage upon both the Governing Body of the profession and this Association, our present Queen was prompt to reveal a continuing awareness of the importance of the activities of those who safeguard the health and well-being of the animal population of her realm, and thus in no small measure that of her subjects also. On the great day itself, however, the horse in particular once more will come gloriously into its own as an unrivalled ceremonial asset and there will be revealed the magnificent response of the Royal Army Veterinary Corps to the heavy commitments placed upon that fine organisation for the provision and training of these superb animals.

Her Majesty already has shown a natural aptitude for her great vocation and the grace with which she fulfils her ceremonial engagements is combined not only with a dignity shared to the full by her consort, but with a gaiety fitting the mood of the nation during the three summer months when high gala will be held. Although the ceremony is not to take place on a Sunday, as was the practice in olden times, Her Majesty herself has asked that none shall forget that the basis of rejoicing is in the solemn ritual of consecration. We are persuaded that this spiritual awareness, inherent in our people and their Ruler, explains the unassailable position of the Crown in the difficult period of transition from British Empire to Commonwealth, and the immediate acceptance throughout the latter, of the truth of the Prime Minister's recent tribute to its standing: "There is no doubt that of all the institutions which have grown up among us over the centuries or sprung into being in our lifetime, the Constitutional Monarchy is the most deeply founded and dearly cherished by the whole association of our peoples."

The Queen and the Duke of Edinburgh shortly will re-assume the duty so familiar to members of our Royal House, of travelling far afield to open windows on to a wider world, alike for our people at home and for those among whom they will move. May there be revealed yet higher destiny for our race, led for a long period of years, so we pray, by the sovereign lady whose radiance holds out so much promise of a glorious reign.

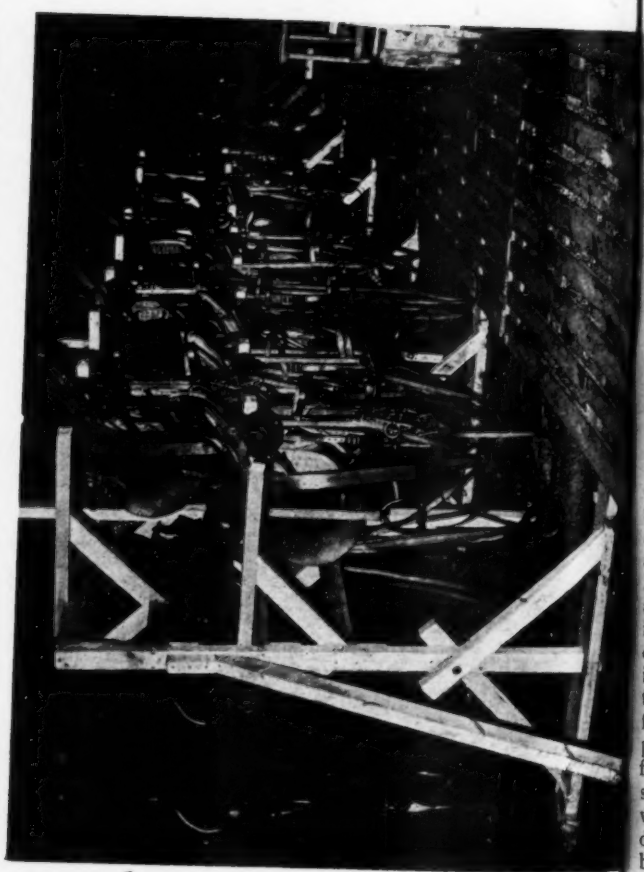


Top left.—Horses being trained for Coronation duties at the Melton Mowbray Depôt. They are seen being ridden through a line of troops waving flags and playing band instruments.

Top right.—Hyde Park habitués lend a useful hand.

Bottom left.—The ingenious type of harness rack evolved by the Corps for use while in camp.

Bottom right.—Part of the "Operational" blackboard, indicating



HORSES FOR THE CORONATION

Preparation by the Royal Army Veterinary Corps

The first fanfare, so to speak, of the approaching Coronation was heard at Droitwich last July, when the Director of the Army Veterinary and Remount Services was requested to provide 40 additional black horses—about twice the normal requirements—for the Household Cavalry. Buyers were sent out, mostly to Ireland, and the appropriate number of "green" horses were purchased. Such horses, of course, though broken, were quite inexperienced and not used to answering the customary aids. The selection and choice of so large a number was a considerable undertaking; but the animals obtained by the R.A.V.C. purchasing officers proved eminently suitable, and they were passed on for the cavalry to put them through their paces.

No sooner was this piece of work carried out than the Corps was faced with the more onerous task of providing about 80 horses needed for the Coronation procession itself, and of training them. Apparently it had not been decided until comparatively late in the day that certain high-ranking officers and others taking part were to be mounted, and accordingly a vital job was passed to the Corps with a minimum time in which to do it.

By now it was approaching the end of 1952, and, having regard to the high standard of training needed, it was necessary to muster the horses, together with a reasonable number of reserves, at the earliest possible moment.

By the end of January, 52 horses were brought back from the Army of Occupation in Germany, while a number more—most of them hunters—were purchased in this country during February.

As purchase and collection of all these horses proceeded, the Equitation Officer at the R.A.V.C. Training Centre and Depot, Melton Mowbray, took them in hand and began to put them through their drill.

At its customary strength the Corps at Melton was undermanned for so big a task. A number of men were borrowed from the R.A.F. to help with grooming and other semi-skilled work. The fact that quite a few of them could not ride did not make matters easier, but they took a very keen interest and have done a good job. At the time of writing most of them are still employed with the Corps, and are working in the special encampment in Hyde Park, where the final training of the horses is being carried out.

The training itself consists mainly in constantly exercising the horses in what one might describe as processional circumstances. Loudspeakers relay massed-band music as they pass. Flags and bunting are waved; personnel are situated at points on the exercise route to gesticulate, shout, and, in general, behave as members of the crowd will do. Additionally, the horses are regularly paraded in front of armed troops so that they can be accustomed to the presenting of arms, the shouts of command, the flashing of light on swords and other weapons, and so on. So far as the imagination can be exercised, every possible sight or sound that could startle the horses on the great day has to be foreseen. The writer was told, for example, that at a previous Coronation, when everything had gone off perfectly until the procession reached the Abbey, the bells suddenly pealed out, causing some of the horses to prance wildly. Thus, the horses at present under training get a daily dose through their loudspeakers of bells, as well as bands, cheers and the tramp of marching infantry.

Although they become gradually accustomed to all the strange sights and sounds to which they are being subjected, it is necessary to keep the horses in constant practice. Apparently, if they were left without experience for a week or 10 days, they would cease to accept the conditions with the nonchalance that those in charge of them so ardently desire.

Of course the horses which are to be ridden by the chief officers of the fighting services, the Prime Minister's escort, the London District Processional Marshals and others, have been chosen, and arrangements made for their destined riders to become accustomed to them. It will be realised that not all those taking part in the procession are necessarily skilled equestrians, and they are glad of the facilities to get to know their animals.

The encampment in Hyde Park, where at present some 80 or more horses are under canvas, includes, within a carefully sited enclosure, everything necessary for both horses and men. It is a self-contained unit with its own barns and farriery, stables, outbuildings, sick lines, telephones and electric light. The saddlery store had been particularly ingeniously planned with an arrangement somewhat analogous to large coat hangers in double series, which enables the accoutrements for every horse to be stored not only in the minimum of space but with the maximum ease of access.

The writer could not fail to realise, as he was shown round the encampment, what a very important job the R.A.V.C. are doing. Much of the dignity, order and effectiveness of the Coronation procession will be the result of the patient skill and care with which the horses are being tended and trained.

Not long after these words are written a further 46 horses, for which temporary stabling has been prepared, will be brought from overseas by the Canadian Royal Mounted Police. While these horses are in England the R.A.V.C. will be responsible for all veterinary treatment, farriery and general assistance. They will be met at the port of disembarkation by a first-aid party of the R.A.V.C., so that help may be given with any troubles that may have arisen during the crossing.

On the day of the Coronation itself the Corps will be responsible for two veterinary aid posts, one of which will be at Wellington Barracks, and the other near Marble Arch. The officers in charge of the training are keeping their fingers crossed that neither of these posts will need to go into action!

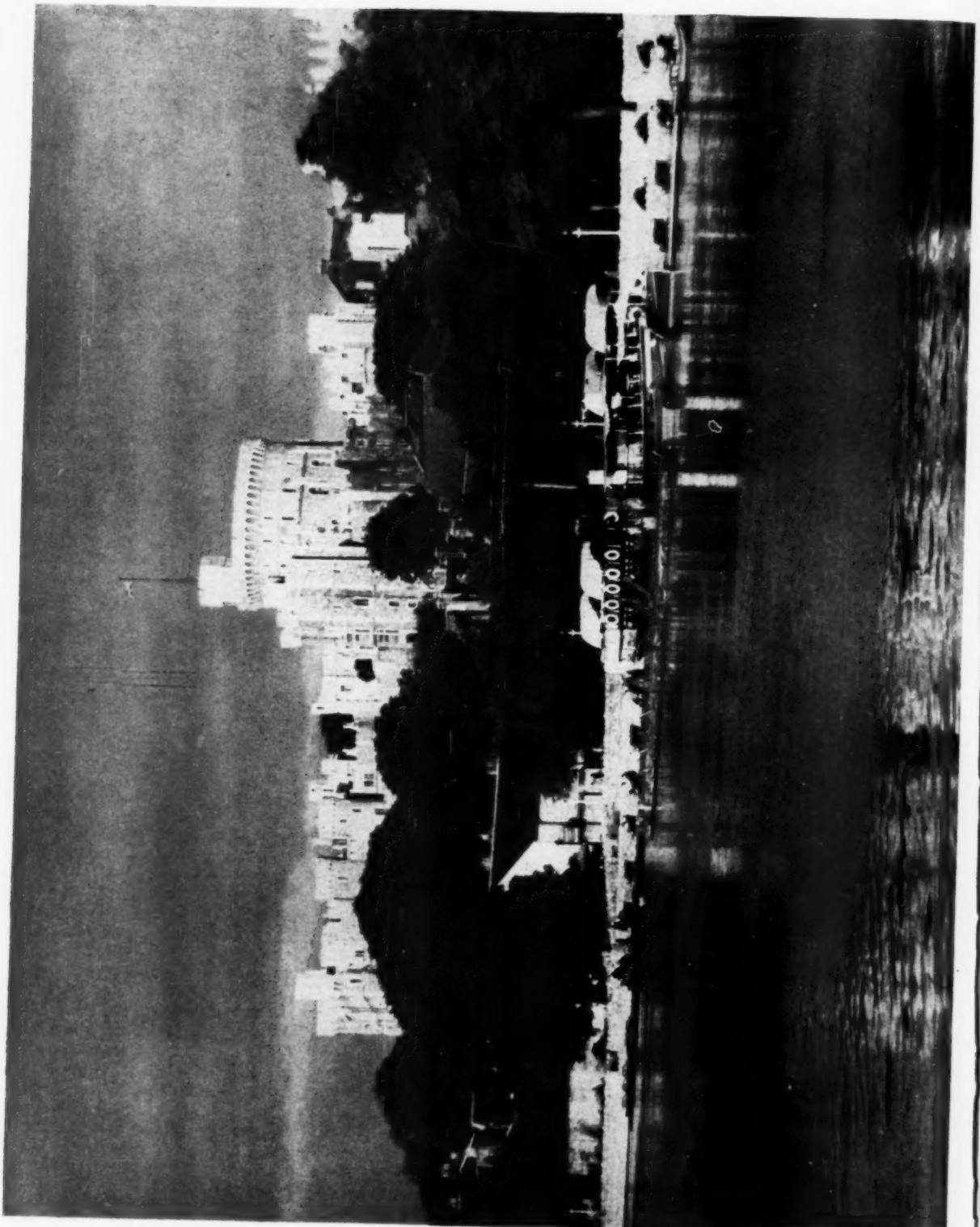
Nor will the Corps' work be finished when the Coronation is over, for the large number of horses under their care will need to be safely dispersed—the Canadian to be embarked, and most of the remaining horses to be absorbed, as far as possible, into the army. Some of the Greys will be temporarily retained and kept under training to mount the Royal Scots Greys escort on the occasion of the State visit to Scotland.

It is not necessary to explain to veterinary surgeons just the amount of work that has been involved in the purchasing, handling and training of all these horses, in order to get them to the exacting standards that will be called for on June 2nd. Speaking as an outsider, the writer ventures to say that the Corps are tackling a very tough job—for which they have been given a minimum of time—in a fashion that is fully in accordance with their highest traditions.

C. M.

Bottom left.—The ingenious type of harness rack evolved by the Corps for use while in camp.

Bottom right.—Part of the "Operational" blackboard, indicating



THE RELATIONSHIP BETWEEN OVARIAN HORMONES AND UTERINE INFECTION

BY

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Introduction

Attempts at transplantation of bovine ova have been made without success by various workers (Umbaugh, 1949; Dowling, 1949, and Rowson, 1951), and it was not until Willett (1952) used a surgical technique involving laparotomy that a pregnancy was obtained. Preliminary investigations (Willett *et al.*, 1952; Brock & Rowson, 1952) had indicated that to interfere with the uterus during the luteal phase, as must be done for successful transplantation, might result in severe infection.

The experiments reported in this paper were carried out in an attempt to establish whether or not a definite relationship exists between ovarian hormones and susceptibility of the uterus to infection. The investigation was divided into five parts:—

1. A bacteriological examination of the uterus prior to and after the introduction of infected material at various stages of the oestrous cycle.
2. An attempt to reproduce the results obtained in (1) using ovariectomised cows.
3. Attempts to prevent the development of infection in the luteal phase by the addition of antibiotics and sulphanilamides to the injected material.
4. Attempts to clear an established infection during the luteal phase by the intramuscular injection of various dose levels of oestrogen.
5. Attempts to clear an established infection by the removal of the corpus luteum, and allowing a natural oestrus to occur.

Material and Methods

Cows were obtained from the Ministry of Food and housed in a straw yard with a vasectomised raddled bull so that oestrus could be detected easily. All cows were examined rectally to eliminate animals with clinical abnormalities of the reproductive tract and to determine the stage of the oestrous cycle. Cows required in the luteal phase were usually selected by the detection of full-sized corpus luteum in the ovary, and in some animals the exact stage of the cycle was known. Those required in the follicular phase were selected by the exhibition of oestrous behaviour. At the conclusion of the experiments all cows were slaughtered and the selections confirmed at *post-mortem* by careful examination of the ovaries.

Swabs were taken for bacteriological examination from the midpoint of the cervix using a sterile speculum and sterile sheathed swab. Immediately afterwards the cows were inseminated with infected material, which consisted of bovine semen diluted with egg yolk buffer, or of cultures of *Corynebacterium pyogenes*.‡ The diluted semen was examined culturally to ensure that it was infected and in some cases where bacteriological examination proved negative a culture of *C. pyogenes* was added to ensure every opportunity of establishing infection.

Inseminations were always carried out by manual fixation of the cervix per rectum, when an insemination pipette was passed through the cervix and the infected material injected into the body of the uterus. At slaughter two days after insemination the genital tracts were removed for bacteriological examination.

Nine cows were ovariectomised *per vaginam* by removing the ovaries with an écraseur. They were then left for at least 14 days before commencing the experiment, in order to ensure that all endogenous ovarian hormones had been eliminated. To reproduce the luteal phase experimentally, three ovariectomised cows were given a sensitising dose of 25 mg. stilboestrol in oil, followed by four daily injections of 50 mg. progesterone, at which point cervical swabs were taken and the cows inseminated. The progesterone injections were then continued until slaughter two days later. For the follicular phase, two ovariectomised animals were given 25 mg. stilboestrol in oil intramuscularly and inseminated 24 hours later when they were exhibiting symptoms of oestrus. No further injections of oestrogen were given and the animals were slaughtered two days after insemination. Four ovariectomised animals were treated as controls and inseminated without hormone treatment, using the standard technique of taking cervical swabs followed by insemination. They also were slaughtered two days later.

In Part 3 of the study, six cows in the luteal phase were selected by examination of the ovaries *per rectum*. Using the standard procedure previously described, three animals were inseminated with semen which had been diluted with egg yolk phosphate buffer plus penicillin, streptomycin and sulphanilamide and stored for 24 hours at +5° C.

The remaining three cows were inseminated with the same semen infected with a culture of *C. pyogenes* and stored with egg yolk phosphate buffer containing penicillin, streptomycin and sulphanilamide, for 24 hours at +5° C. All animals were slaughtered two days after insemination.

In the fourth experiment cows in the luteal phase were infected by introducing a culture of *C. pyogenes* into the uterus. After two days the existence of pyometra was established by culturing samples of pus withdrawn from the uterus, at which time various dose levels of stilboestrol were injected intramuscularly. Two cows were given 25 mg., two 50 mg., three 75 mg., and three 100 mg. All cows were slaughtered three days after the stilboestrol injection and cultural examination of the uteri was carried out. One of the cows receiving 100 mg. showed signs of oestrus.

In the fifth experiment six cows at the luteal phase were infected as in experiment 4. Two days later the presence of pyometra was established by bacteriological examination of pus withdrawn from the uterus. The corpora lutea were then removed manually *per rectum*, and the cows allowed to come into oestrus. They were all slaughtered two days later.

In all cases cultures were carried out on horse blood agar plates incubated at 37° C. aerobically, anaerobically and in air with 10 per cent. CO_2. In the majority of cultures a fourth plate was smeared and covered with a layer of fresh melted agar which was thoroughly dried in order to overcome the difficulty of possible contamination with *Proteus*.

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† Working from the Public Health Laboratory, Cambridge.

‡ Isolated from the semen used to inseminate Cow No. 3. See Table I.

Results

1. Bacteriological Examination of the Uterus Prior to and After the Introduction of Infected Material at Various Stages of the Oestrous Cycle

Results of examinations of cervical swabs, semen and uteri at slaughter in Part 1 of the experiment are given in Table I for cows inseminated during the luteal phase and Table II for cows inseminated during oestrus. Of the 11 cows inseminated during the luteal phase, eight had pyometritis of varying severity. Of this group one animal (No. 3) had a sterile pyometritis, while the remaining seven were shown to be infected by culture of the uterine swabs at slaughter (Plate 1). An additional animal (No. 8) had no symptoms of pyometritis at slaughter, but heavy growths resulted after culture of the uterine swabs. In two animals (Nos. 12 and 7), inseminated one and three days post-oestrum respectively, no infection or pyometritis resulted. However, the semen used for insemination in these cases contained a few saprophytes only.

Six cows inseminated during oestrus had no symptoms of pyometritis or bacteriological infection on *post-mortem*, even though in every case the semen used to inseminate them two days previously contained *C. pyogenes* (Table II).

Table I

Results of Bacteriological Examinations of Cervical Swabs and Semen taken before Insemination and of Uteri at Slaughter Two Days later in Cows Inseminated at Various Stages in the Luteal Phase

Cow number	Approximate days post-oestrum	Bacteriological examination of cervical swab before insemination	Bacteriological examination of semen used for insemination	Examination of the uterus at slaughter	Bacteriological examination of uterus (right horn, left horn and body) at slaughter
1	10–12	Almost sterile (two colonies *Strep. viridans*)	Heavy growth of *Proteus*	Pyometra with numerous polymorphonuclear cells	*Proteus*, staphylococci (coagulase negative)
3	7	Sterile	Scanty growth of *C. pyogenes*, some anaerobic micrococci	Pyometra with heavy leucocyte infiltration	All swabs sterile in aerobic and anaerobic culture
6	14–16	Few coliforms and *Strep. viridans*	A few diphtheroids	Heavy pyometra with polymorphonuclear cells	*Bacterium coli* and green streptococci (faecal type, Lancefield's Group D)
7*	3	Few coliforms, *Staph. albus*	Scanty growth of diphtheroids and *Strep. viridans*	A few polymorphonuclear cells, no definite pyometra	Sterile cultures
8	8	Sterile	Scanty growth faecal streptococci and *C. pyogenes*	Small number of polymorphonuclears, no other clinical symptoms	Heavy growth *Staph. aureus*, *Strep. viridans*, coliforms and *C. pyogenes*
9	6	Moderate growth *C. pyogenes*	Heavy growth *Pseudomonas pyocyanea*	Uterus full of watery pus, large numbers of polymorphonuclears present	Heavy growths of *Proteus* and *C. pyogenes*
10	12–14	Sterile	Heavy growth *Pseudomonas pyocyanea*	Heavy pyometra with many polymorphonuclear cells present	Heavy growths of *Proteus* and *C. pyogenes*
11	2	A few saprophytes	Few colonies of *Pseudomonas pyocyanea*	Slight pyometra with watery pus	Heavy growths of diplococci
12	1	A few saprophytes	Few colonies of *Pseudomonas pyocyanea*	No clinical abnormalities	A few cocci, otherwise sterile
13	10	Scanty growth *Strep. viridans* and coagulase negative staphylococci	Scanty growth small haemolytic corynebacteria closely resembling *C. pyogenes*	Heavy pyometra with numerous polymorphonuclears	Heavy growths of coliforms, slight growth of *C. pyogenes*
14	3–4†	Sterile	Scanty growth of coliforms and *Strep. viridans*	Slight pyometra	Scanty growth of *Strep. viridans* and staphylococci

* Large cervical abscess.
† Very small corpus luteum estimated about two days post-ovulation.

Table II

Results of Bacteriological Examinations of Cervical Swabs and Semen before Insemination and of Uteri at Slaughter Two Days later in Cows Inseminated at Oestrus

Cow number	Stage of cycle	Bacteriological examination of cervical swab before insemination	Bacteriological examination of semen used for insemination	Examination of the uterus at slaughter	Bacteriological examination of uterus at slaughter (right horn, left horn and body)
2	Oestrus	A few colonies *Staph. albus* and streptococci (Lancefield's Group K)	*Staph. albus*, diphtheroids and a few colonies of *C. pyogenes*	Epithelial cells and a few polymorphonuclear cells only; no other clinical symptoms	Sterile
4	Oestrus	Sterile	Scanty growths of *C. pyogenes*, *Staph. albus* and coliforms	Epithelial cells only	Sterile
5	Oestrus	Sterile	Scanty growth of *C. pyogenes*, *Proteus* and coliforms	A few polymorphonuclears, no other cells	Sterile
15	Oestrus	Sterile	Scanty growth *Strep. viridans* and corynebacteria	No polymorphonuclears. No pyometra	Sterile
16	Oestrus	Heavy growth of mixed cocci	Scanty growth of *Strep. viridans* and *C. pyogenes*	No polymorphonuclears. No pyometra	Sterile
17	Oestrus	Heavy growth of mixed cocci	Scanty growth of *Strep. viridans* and *C. pyogenes*	No polymorphonuclears. No pyometra	Sterile

2. An Attempt to Reproduce the Results Obtained in (1) Using Ovariectomised Cows

Table III presents the results of Part 2 of these experiments in which ovariectomised animals were used. Four ovariectomised cows were used as controls and received no hormone treatment. In Cows Nos. 21 and 22, which were inseminated with semen containing *C. pyogenes*, a sterile pyometritis resulted. In Cows Nos. 26 and 27 a culture of *C. pyogenes* was added to the semen which had proved sterile on culture. Cow No. 26 had pyometritis on slaughter with a few colonies of *C. pyogenes* in one half of the uterus only. In Cow No. 27 no symptoms of pyometritis or bacterial infection were observed. Two 8 mm. follicles were present on some ectopic ovarian tissue in this animal.

In two animals (Nos. 28 and 29) where 25 mg. of stilboestrol induced oestrous behaviour, insemination at oestrus with semen to which a culture of *C. pyogenes* had been added failed to produce symptoms of pyometritis and the uterine swabs taken at slaughter were sterile (Plate 2).

Three animals (Nos. 24, 25 and 30) which received 25 mg. stilboestrol to induce oestrus, followed by 50 mg. progesterone in oil intramuscularly per day, for four days, had a severe infected pyometritis when inseminated with infected semen four days post-oestrus and slaughtered two days later (Plate 3).

3. Attempts to Prevent the Development of Infection in the Luteal Phase by the Addition of Antibiotics and Sulphanilamides to the Injected Material

Table IV presents the results of the examination of cows inseminated during the luteal phase with infected semen which had been stored for 24 hours with penicillin, streptomycin and sulphanilamide. Three animals (Nos. 33, 34 and 35) which were inseminated without the addition of *C. pyogenes* to the semen used, had no symptoms of pyometritis at slaughter, and the uterine swabs were sterile. In the remaining three cows (Nos. 36, 37 and 38), which were inseminated with semen plus a culture of *C. pyogenes* stored with antibiotics and sulphanilamide, the uterine swabs were sterile at slaughter but slight pyometritis was present (Plate 6).

It appeared from Part 1 of these experiments that to introduce infection into the uterus during the luteal phase frequently resulted in severe pyometritis. It is, however, common practice to treat pyometritis in cattle by uterine irrigation during the luteal phase with Lugol's iodine solution. It seemed desirable to test the effect of introducing Lugol's solution during this stage of the cycle. In preliminary experiments swabs were taken from the cervix of two cows which had no clinical symptoms of pyometritis, and these proved sterile on culture. Fifty ml. of Lugol's

Table III

Results of Bacteriological Examinations of Cervical Swabs and Semen before Insemination and of Uteri at Slaughter Two Days after Insemination in Ovariectomised* Cows and Ovariectomised* Cows Treated with either Stilboestrol or Progesterone

Cow number	Treatment before insemination	Bacteriological examination of cervical swab before insemination	Bacteriological examination of semen used for insemination	Examination of the uteri at slaughter	Bacteriological examination of uterus at slaughter (right horn, left horn and body)
21	♀	Sterile	Moderate growth of *C. pyogenes* and *Staph. albus*	A few flakes of solid pus. Numerous polymorphonuclears	Sterile
22	♀	Scanty growth *Staph. albus* and diphtheroids	Moderate growth of *C. pyogenes* and *Staph. albus*	Large number of blood cells, some polymorphonuclears	Sterile
27	♀†	Sterile	Semen + culture of *C. pyogenes*	No polymorphonuclears or organisms seen	Sterile
26	♀	Sterile	Semen + culture of *C. pyogenes*	Numerous polymorphonuclears but no organisms	Sterile in left horn and body of uterus. Few colonies *C. pyogenes* in right horn
28	♀‡ + stilboestrol	Scanty growth of haemolytic streptococci. Group C	Semen + culture of *C. pyogenes* (heavy growth of *C. pyogenes*, coliforms and diphtheroids)	Uterus clear, no polymorphonuclears	Sterile
29	♀‡ + stilboestrol	Scanty growth of *Strep. viridans*	Semen + culture of *C. pyogenes* (heavy growth of *C. pyogenes*, a few diphtheroids and coliforms)	Uterus clear	Sterile
30	♀§ + progesterone	Sterile	Semen + culture of *C. pyogenes* (heavy growth of *C. pyogenes*, *Bact. coli* and *Ps. pyocyanea*)	Uterus full of pus, numerous polymorphonuclears	Heavy growth of *C. pyogenes* and *Bact. coli*
25	♀§ + progesterone	Sterile	Moderate growth of *C. pyogenes* and *Staph. albus*	Uterus full of pus, polymorphonuclears	Heavy growth *C. pyogenes* and *Proteus*
24	♀§ + progesterone	Scanty growth of *C. pyogenes*	Moderate growth of *C. pyogenes* and *Staph. albus*	Uterus full of pus containing a few polymorphonuclears	Heavy growth of *C. pyogenes*, *Strep. viridans* and *Bact. coli*

* Ovariectomy at least 14 days before insemination.
† Some ectopic ovarian tissue with two 8 mm. follicles.
‡ 25 mg. stilboestrol subcutaneously which induced oestrus the following day, when the animals were inseminated.
§ 25 mg. stilboestrol subcutaneously followed by 50 mg. progesterone in oil per day intramuscularly. The cows were inseminated four days post-oestrum and killed six days post-oestrum.

EXPLANATION OF PLATES

Plate 1.—Uterus of Cow No. 13 two days after insemination with infected semen during the luteal phase, showing pus oozing from the uterine lumen.

Plate 2.—Healthy uterus of ovariectomised Cow No. 28 which was given 25 mg. stilboestrol one day before introducing infected semen.

Plate 3.—Uterus of ovariectomised Cow No. 30 given 50 mg. progesterone daily before infected semen was inseminated, showing the slight accumulation of pus in the uterine lumen.

Plate 4.—A sterile pyometritis produced as a result of treating a clinically normal cow with Lugol's iodine solution during the luteal phase.

Plate 5.—An infected pyometritis produced by introducing bacteria into the uterus during the luteal phase. A 25 mg. intramuscular dose of stilboestrol failed to remove the pyometritis.

Plate 6.—A sterile luteal phase uterus containing some cellular debris, the cow being inseminated with infected material which was left in contact with antibiotics for 24 hours prior to insemination.

Table IV

Results of Examination of Cervical Swabs and Semen before Insemination and of Uteri at Slaughter Two Days later in Cows Inseminated in the Luteal Phase with Semen stored for 24 hours at +5° C. with Antibiotics and Sulphanilamide*

Cow number	Approximate stage of cycle	Bacteriological examination of cervical swab before insemination	Bacteriological examination of semen used for insemination	Examination of the uteri at slaughter	Bacteriological examination of uterus at slaughter (right horn, left horn and body)
33	9th day	Sterile	Sterile†	No severe pyometra. Small number of polymorphonuclears	Sterile except for a few yeasts in aerobic cultures
34	10th day	Sterile	Sterile†	No pyometra. A small number of polymorphonuclears	Sterile
35	15th–16th day	Scanty growth *Bact. coli* and *Strep. viridans*	Sterile†	No polymorphonuclears or organisms	Sterile
36	9th day	Sterile	Sterile‡	Brownish pus in uterus. Moderate number of polymorphonuclears	Sterile
37	8th day	Sterile	Sterile‡	Whitish pus in uterus. A few polymorphonuclears	Sterile
38	13th–15th day	Sterile	Sterile‡	Uterus contained clear fluid. No polymorphonuclears	Sterile

* Final concentration per ml. semen = 1,000 I.U. penicillin, 500 I.U. streptomycin with 0·3 per cent. sulphanilamide.
† Semen before adding antibiotics and sulphanilamide contained a mixed growth of coliforms, yeasts and a small diphtheroid which was not *C. pyogenes*.
‡ Semen before adding antibiotics and sulphanilamide contained a mixed growth of coliforms, yeasts and a small diphtheroid to which a culture of *C. pyogenes* was added.

Table V

Results of Bacteriological Examinations of Cervical Swabs before Uterine Irrigation with Lugol's Iodine Solution in the Luteal Phase of the Cycle and of Uteri at Slaughter Two Days later

Cow number	Approximate stage of cycle at time of treatment with Lugol's solution	Bacteriological examination of cervical swab before treatment	Examination of the uterus at slaughter	Bacteriological examination of uterus at slaughter (right horn, left horn and body)
31	9th day	Scanty growth of *Strep. viridans*	Severe pyometra of whitish pus containing numerous polymorphonuclears	Sterile
32	7th day	Scanty growth of *Strep. viridans*	Severe pyometra of whitish pus containing numerous polymorphonuclears	Sterile

solution were introduced into the body of the uterus using an insemination tube passed through the cervix. The cows were slaughtered two days later and the uterine swabs cultured using the standard technique. The results presented in Table V showed that in both cases a sterile pyometritis resulted from this treatment (Plate 4).

4. Attempts to Clear Established Infection During the Luteal Phase by the Intramuscular Injection of Various Dose Levels of Oestrogen

Table VI shows the results of this experiment. The uteri of cows receiving 25 and 50 mg. stilboestrol contained obvious pus (Plate 5), but two of those receiving 75 mg. showed no clinical signs of infection at slaughter although cultures showed they all were, in fact, infected. The uteri of the cows receiving 100 mg. stilboestrol were sterile. It appears that the dose of oestrogen is the governing factor in overcoming infection in the presence of a corpus luteum. Further research is needed to show whether this dosage level is adequate in all cases.

5. Attempts to Clear an Established Infection by the Removal of the Corpus Luteum and Allowing a Natural Oestrus to Occur

The results of this experiment are shown in Table VII. It can be seen that in every case after an oestrous period following removal of the corpus luteum the uteri were sterile despite the existence of pyometra two days previously.

Discussion

In these experiments insemination of cows during the luteal phase with infected semen almost invariably resulted in pyometritis which in most cases contained heavy growths of the organisms introduced with the semen. Insemination at oestrus failed to produce pyometritis or infection, even though in each of the six cases the semen used contained *C. pyogenes*. Controlled experiments using ovariectomised cows (Part 2) showed that this effect is due to the positive action whereby progesterone promotes conditions conducive

L. E. A. ROWSON, G. E. LAMMING AND R. M. FRY: OVARIAN HORMONES IN UTERINE INFECTION

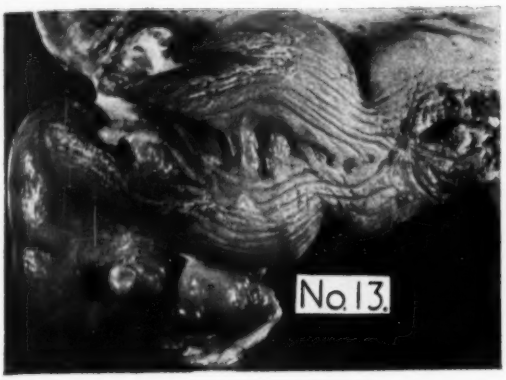

PLATE 1.

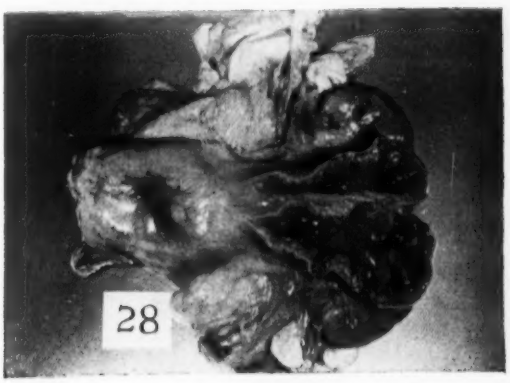

PLATE 2.

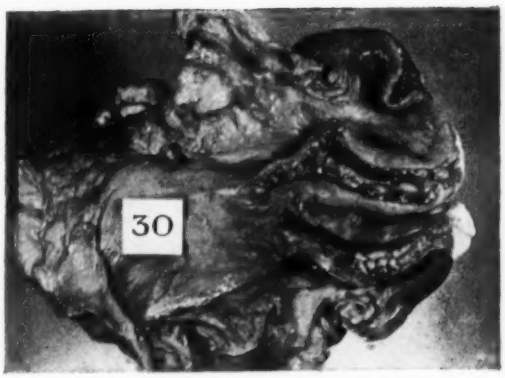

PLATE 3.

PLATE 4.

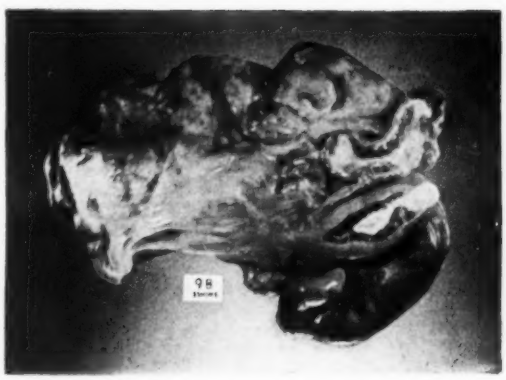

PLATE 5.

PLATE 6.

TABLE VI

RESULTS OF EXAMINATION OF COWS INFECTED DURING THE LUTEAL PHASE AND ATTEMPTS TO TREAT THE INFECTIONS WITH SINGLE INJECTIONS OF STILBOESTROL GIVEN INTRAMUSCULARLY

Cow number	Day of cycle when infected	Bacteriological examination of cervical swab	Bacteriological examination of uterine contents before injection of stilboestrol	Amount of stilboestrol injected, mg.	Examination of uteri at slaughter three days after stilboestrol treatment	Bacteriological examination of uterine swabs at slaughter (right horn, left horn and body)
9 b.	5th–6th day	Sterile	Thick pus containing a heavy growth of *C. pyogenes* and a moderate mixed growth of contaminants	25	Uterus full of thick white pus	Heavy pure growth of *C. pyogenes*
10 b.	8th day	Very scanty growth of *Strep. viridans*	Thick pus containing a heavy growth of *C. pyogenes* and a moderate mixed growth of contaminants	25	Uterus full of thick white pus	Heavy, almost pure, growth of *C. pyogenes*
11 b.	8th day	Sterile	Thick pus containing a scanty growth of *C. pyogenes*	50	Slight pyometra with much clear fluid	Very heavy growth of *C. pyogenes*
12 b.	5th day	Sterile	Thick pus containing a heavy growth of *C. pyogenes*	50	Some pus in uterus, purulent discharge from cervix	Left horn scanty growth of *C. pyogenes*; right horn and body heavy growth of *C. pyogenes*
13 b.	5th day	Sterile	Thick pus containing a heavy growth of *C. pyogenes*	75	No pyometritis	Moderate growth of *C. pyogenes*
14 b.	12th day	Sterile	Thick pus containing a heavy growth of *C. pyogenes*	75	A few small flakes of white pus	Moderate to heavy growths of *C. pyogenes*
15 b.	7th day	Sterile	Pus containing a heavy growth of *C. pyogenes*	75	No pyometritis	Moderate to heavy pure growths of *C. pyogenes*
18 b.	4th day	Sterile	Thick pus with moderate growths of *C. pyogenes* and mixed contaminants	100	No pyometritis, uterus very hyperaemic	All cultures sterile
19 b.	9th day	Sterile	Thick pus with heavy growth of *C. pyogenes*	100	No pyometritis, uterus very hyperaemic	All cultures sterile
21 b.	9th day	Sterile	Thick pus containing a heavy growth of *C. pyogenes*	100	No pyometritis, uterus very hyperaemic	All cultures sterile

TABLE VII

RESULTS OF EXAMINATIONS OF COWS INFECTED IN THE UTERUS WITH A CULTURE OF *C. pyogenes* DURING THE LUTEAL PHASE, AND OF EXAMINATIONS OF THE UTERI TWO DAYS AFTER HEAT INDUCED BY MANUAL REMOVAL OF THE CORPUS LUTEUM

Cow number	Bacteriological examination of cervical swab before infection	Observation on uterine contents withdrawn at time of removal of the corpus luteum	Examination of uterus at slaughter	Bacteriological examination of uterus (left horn, right horn and body) at slaughter
1 b.	Scanty growth of *Staph. aureus* and *Strep. viridans*	Thick pus containing a heavy growth of *C. pyogenes*	No pyometritis	Sterile
3 b.	Sterile	Thick pus containing a heavy growth of *C. pyogenes*	No pyometritis	Sterile
4 b.	Scanty growth of streptococci	Thick pus containing a heavy growth of *C. pyogenes*	No pyometritis. A very few polymorphonuclear cells	Left horn all cultures sterile; right horn and body aerobic cultures sterile, but in anaerobic cultures total of seven colonies *C. pyogenes*
5 b.	Sterile	Thick pus containing a heavy growth *C. pyogenes*. Scanty growth mixed contaminants	No pyometritis	Sterile
7 b.	Slight growth *Staph. albus*. Moderate growth *Strep. viridans*	Thick pus with a heavy growth of *C. pyogenes*	No pyometritis	Sterile
8 b.	Moderate growth of mixed contaminants	Thick pus containing a heavy growth of *C. pyogenes*	No pyometritis	Sterile

to infection. In the absence of progesterone in ovariectomised cows the bacteria introduced were not detectable by standard techniques two days later, although a heavy polymorphonuclear cell infiltration persisted in the uterus. When either endogenous or exogenous oestrogen is present the bovine uterus appears remarkably resistant to infection. It is interesting in this respect to note that ovariectomised Cow No. 27 did not have the typical symptoms of a sterile pyometritis as shown by Nos. 21 and 22, probably due to endogenous oestrogen produced by the two small follicles on ectopic ovarian tissue.

It appears that the anterior vagina and cervix of the cow is not an area from which bacteria are introduced into the uterus for in the majority of these cows the cervical swabs were sterile.

Experiments using ovariectomised cows indicate that stimulation of bacterial growth is a positive action of progesterone, an effect which may be allied to its fundamental rôle in promoting conditions in the uterus suitable for the developing zygote. Oestrogen appears to prevent bacterial development, for sterile uterine swabs resulted at slaughter after introducing bacteria into the uterus of the oestrous cow. The exact rôle of oestrogen in preventing infection is not made clear by these experiments. However, many interesting possibilities are brought to mind.

It is known that oestrogen promotes development of the terminal blood supply to uterine mucosa (Hansel & Asdell, 1951; Hechter, Krohn & Harris, 1941; 1942), increasing the blood flow and thus providing increased quantities of phagocytes to the site of infection. Oestrogen stimulates uterine

contractions and may thus effect the removal of bacteria through the cervix (Rowson, 1942). These effects may indicate a local action on the uterus of progesterone on the one hand and oestrogen on the other.

The results of the present experiment indicate that progesterone promotes bacterial growth but it is possible that it also has a general effect in lowering resistance. Alternatively, while oestrogens clearly prevent bacterial growth in the uterus, they may do so by increasing body resistance to infection. Moberg (1952) has carried out blood leucocyte counts at various stages of the cycle in the cow and finds a considerable increase during oestrus as compared with blood obtained during the luteal phase.

Von Haam & Rosenfeld (1942) conducted experiments showing that the production of antibodies in rabbits after injections of pneumococci was greater in the presence of exogenous oestrone than when no oestrone was given. Foley & Aycock (1944) showed that a lower percentage of mice died after injection of streptococci when stilboestrol was given than when no stilboestrol was given.

Part 2 of these experiments shows that storage of semen with the usual level of antibiotics used in artificial insemination practice will prevent the development of infection after insemination during the luteal phase, presumably by destroying bacteria and rendering the semen non-infective. Many authors have reported that as the interval between the end of heat and insemination increased, the conception rate decreased (Barrett & Casida, 1946; Stewart, 1950; and others). Since Edgar (1952) showed by chromatographic techniques that progesterone is present in the unruptured bovine follicle, it is possible that this decrease in conception rate is, in part, due to infection resulting from insemination just before or after ovulation. Further, it is possible that the increased conception rate observed as the result of the addition of antibiotics to semen may be due to preventing infection of cows inseminated during this time, especially when the semen used is from bulls of low fertility.

Before the extensive use of antibiotics, post-parturient and post-abortion infections in humans were frequently the cause of deaths. In cases of abortion the corpus luteum may persist for some considerable time and after parturition in humans a corpus luteum of lactation will maintain body progesterone level in lactating women and thus prevent the recurrence of menstruation. Such conditions may favour the growth of any bacteria introduced during parturition or during abortion. Experiments now planned are designed to test the therapeutic effect of exogenous oestrogens in such cases.

It is well known that cows will recover spontaneously from *Vibrio foetus* and trichomonad infection after several heats without reinfective coitus. The present experiments indicate that this effect may be due to the action of recurrent periods of high oestrogen levels. It is perhaps significant that the bull does not recover from such infections spontaneously, possibly due to the continuing supply of testosterone which has a systemic effect similar to that of progesterone, and thereby promotes conditions where spontaneous recovery is unlikely. Further experiments now in progress are designed to show whether injections of stilboestrol into bulls will aid their recovery from the infections of *V. foetus* or trichomoniasis.

Summary and Conclusions

1. The bovine uterus during oestrus appears remarkably resistant to infection introduced either as infected semen or as a culture of *C. pyogenes*. During the luteal phase the bovine uterus appears equally susceptible to such infection and pyometritis frequently results.

2. Experiments on ovariectomised cows show that exogenous progesterone promotes conditions suitable to the growth of certain bacteria, while exogenous oestrogen will render the bovine uterus equally resistant to infection.

3. The addition to semen of penicillin, streptomycin and sulphanilamide at the usual rates used in artificial insemination practice will prevent the development of bacteria after insemination during the luteal phase. Preliminary results indicate that the use of Lugol's solution during the luteal phase can produce a sterile pyometritis.

4. Uterine infections may be established and controlled by varying the ovarian hormone levels. They can be produced in the presence of a corpus luteum and suppressed either, on the one hand, by its removal or, on the other, by injecting high doses of oestrogen.

These results may indicate the possibilities of using exogenous oestrogens to treat puerperal sepsis in humans, or *V. foetus* and trichomonad infections in the bull. They may explain why the cow recovers spontaneously from trichomonad and *V. foetus* infections after several heat periods without reinfective coitus, whereas the bull does not recover spontaneously since testosterone has a systemic effect similar to that of progesterone in the cow.

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They also wish to acknowledge the help given by the staff of the Unit of Animal Reproduction and of the Public Health Laboratory, particularly that given by Dr. Boissard, who carried out the bacteriological tests in experiments 4 and 5.

Thanks are also due to Dr. Hammond for advice and encouragement and to Mr. Strange, who greatly assisted throughout the whole of this work.

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VETERINARY SURGERY: PRESENT AND FUTURE*

Teaching

I.—By C. FORMSTON,
STREATLEY

I believe the essence of teaching, irrespective of subject, is to endeavour to teach the student how to learn, how to reason, and how to think. In a vocational training such as ours this, on the surface, would appear to be relatively simple, particularly when a student has commenced his clinical studies. This is not my experience, however. The average student is still an ardent supporter of formal lectures, factual teaching and the written word. The latest soporific is the surgical film. When will that spirit of curiosity exert itself to inspire the individual to do things for himself, to conduct his own practical investigations, to check up on the spoken and written word, to seek knowledge for its own sake and for the mental satisfaction that follows such effort? Words have to be memorised—any mental picture they create can easily become the most complicated jig-saw puzzle. More active investigational procedures conducted by the fingers appear to the eyes as more animate and composite pictures which may become indelibly stamped on the mind for all time. In short, a student may be told how to conduct a certain operation; he may see it done several times; he will know little about it until he actually does it himself. One can well imagine that the pleasures of dissection were marred by the thought of impending examination, but that is not a sufficient reason for the abdominal cavity of the dog or the limbs of the horse to remain mysteries to the student until just prior to his final examination. The bovine pregnant uterus is by no means a rarity, but the only time a student is persuaded to take an interest in its contents is at an organised overcrowded demonstration where he finds bodily height a distinct advantage. When compared with his medical counterpart the veterinary student is singularly fortunate in that he has almost unlimited living and cadaver material at his disposal. It is there for the asking but he is seldom interested. What would the average surgeon give for the opportunities of conducting dissections or operative techniques on the human cadaver whenever he felt it would be helpful?

The student year can be divided into two parts, the time he spends within the precincts of a college, approximately 28 to 30 weeks, and that which is spent extramurally. It is on this basis that I would venture to suggest the lines on which the present-day student might be encouraged and stimulated to learn.

Within the College.—The main requirements here are some degree of enthusiasm for the subject on the part of student and teacher, dynamic teaching together with adequate clinical material and teaching facilities generally. The veterinary schools in this country when compared with those on the Continent and across the Atlantic are virtually starved of clinical material; this dearth tends to produce apathy in the student and is somewhat soul destroying in the most enthusiastic teacher. Under present conditions tutorial classes often consist of 20 to 30 students congregated in an atmosphere of make-believe and semi-boredom around a normal animal.

This state of affairs, to my way of thinking, can be remedied only by the teaching centres possessing their own large- and small-animal clinics. Patients would be supplied in the main from a practice run by the school. For complete satisfaction the practice must be directed from and have its headquarters at that particular school. Where more adaptable, the headquarters or centres would be the Field Station. Ambulatory facilities would be regarded as necessary and complementary. In this way only can a reasonably constant flow of fresh clinical cases be assured and with adequate hospital facilities the student could then be directed to make his own observations, record his findings and follow the case through to the time of its discharge. With such facilities "walking the wards" would become a term with some real veterinary significance comparable with that in a human hospital.

I do not think it is sufficient for students merely to group themselves around a case and wait for the "pearls" which drop from the consultant's lips. It is far better when opportunity lends itself, to allow students to be their own consultants and when they have completed their examination of the subject and feel in a position to express an opinion or make a diagnosis, they should then report to the teacher in charge. This would go a long way towards meeting the criticism often levelled at new graduates that they lack "approach" to the client. It would inculcate the necessity of obtaining careful histories, give them practice in routine examinations, allow them the responsibility of making deductions and arriving at conclusions and, perhaps by no means least, give them the opportunity of cultivating, in its truest and most ethical sense, "the bedside manner."

On the more purely surgical side I would like to see an adequately equipped dissection *cum* surgical demonstration room where the student could spend his own chosen time, with or without supervision, actively engaged in surgical dissection, comparative anatomical studies, obstetrical investigations and practising operative techniques. Around the walls would be anatomical and surgical specimens for ready reference. The room would be fitted with a projection apparatus through which "stills" (photographic and diagrammatic) and film strips of operative techniques could be projected by the student for practical guidance. Here I might mention that I have been a little disappointed with surgical films as a medium of teaching surgical techniques. It cannot be denied that films are of service. They have a definite entertainment value and illustrate clearly the surgical skill of the operator, but the technical assistance derived by the viewer falls short of what one would desire. Films have been used in the Royal Veterinary College since the advent of Sir Frederick Hobday and latterly with the distinct improvements associated with the film industry in general. Films depicting natural sequences such as the act of parturition or lameness are second only to witnessing the actual scenes, but it is obvious that the skill and manual dexterity of the operator in a truly surgical film cannot readily be imbibed from what are only fleeting glances of operation sequences. My views coincide with those expressed in the *British Medical Journal* (No. 4777, p. 225): "A series of really good 'still' pictures by an artist remains one of the best ways of imparting knowledge of surgical techniques outside the operating theatre." Unfortunately, finances are not likely to permit an artist to "cover" veterinary operations and techniques. In brief, if the current treatment of fractures in veterinary patients can be cited as an example, then the individual student must be given facilities for applying plates to, or introducing a pin into, the normal or fractured bone in the cadaver.

Reasonable laboratory facilities might also be provided to

* Symposium held at the 10th Ordinary General Meeting of the Association of Veterinary Teachers and Research Workers held at the Royal Veterinary College, London, N.W.1, on Friday, January 2nd, 1953.

enable the student to conduct his own microscopical investigations into those problems which come within the purview of surgery and obstetrics.

One cannot leave the subject of intramural teaching without some comment on formal lectures. Everyone will agree that this aspect can be and is overdone. The problem is to find an alternative, particularly in schools where there are large classes which make sectional tutorials themselves a problem if one is to avoid tiresome repetition. The student likes typewritten sheets but these collectively tend to become the student's "bible" and destroy his interest in current literature. Perhaps a compromise would be a synopsis of lectures and more tutorials and practical classes. In some schools this would mean augmenting the number of junior staff or reducing the number of students, but the crux of the whole situation lies in developing sources of supply of sick animals in quantity.

Extramural Tuition.—Here, I am afraid, the term "seeing practice" is taken far too literally. I believe it is wrong to put all the onus on the practising veterinary surgeon, particularly at a time when the job he has in hand is a full-time occupation. With the present limited facilities in the schools I feel it is up to the teacher to apprise the student how he can best utilise those facilities he will readily find in the average mixed practice. If he could only apply his activities in the direction of that part of the curriculum covered by the previous term's lectures, it would go a long way towards understanding more thoroughly that part of the work which he will in due course "mug up" for his examination. Should the student, through the good offices and with the co-operation of his veterinary surgeon, be given holiday tasks? What is more to the point perhaps: would the student take them seriously? Let it be remembered that, in the majority of cases, the attention given to students in practice is individual.

This is in strong contrast to that in some of the schools where the number of students in a class may vary from 60 to 80 or even more.

I would like to see the student compile his own surgical and obstetrical museum from items of material collected during the vacations he is "in practice." I am certain he can be introduced to the local slaughterhouse, knacker yard (a veritable mine of information) and hunt kennels where, with average decorum and a modicum of good sense, he would be allowed to do and learn much. It is not an uncommon occurrence for a student about a fortnight before his final examination to ask his teacher for a dead dog in order that he might *do* his operations! Set to perform an operation on the cadaver during his final examination a candidate may exhibit a mediocre technique and a poor sense of anatomy, and when asked if he has practised that particular technique previously he benignly says "No." Does the fault lie with the system of education, or the teachers, or is there a "spoon fed" mentality which we ought to try to eradicate? Surely, if they are not readily available for everyone in the College, there are abundant facilities in practice for most of those interferences to be performed either privately or under some degree of supervision. I have found that the veterinary surgeon in practice is always willing to find time to help the student who is keen to help himself. Bovine rectal explorations can be made at a slaughterhouse or a knacker yard with far less trepidation than on a client's farm, with the added advantage of being able to check his findings at *post-mortem* examination. He may even be allowed to take the "bits and pieces" home with him, to examine them there at his leisure.

Finally, a word on student case books and case recording. For some time now the R.C.V.S. has decreed that the student shall keep records of cases seen extramurally and produce case books "attested by the extramural teacher" at the time he presents himself for his final examination if he is required to do so. The R.C.V.S. deserves every commendation for instituting such a measure but its value is lost sight of by the average student who regards the keeping of case records as an unnecessary imposition. Some are excellent presentations of clinical material which it has been their good fortune to witness and bear adequate testimony to the industry of the owner. Many, however, bear little or no resemblance to clinical records; the English is poor, colloquialisms and farmyard jargon are commonplace and verbs are conspicuous by their absence. Case recording is a valuable part of the student's training if it only trains him to develop his powers of observation and I think more responsibility should be shouldered by the teachers in the schools. These aspirations fall far short of what is desired, however, if clinical cases are not available in the teaching institutions. Nevertheless, as things are at the moment, the veterinary surgeon in practice could render a signal service if case books were regularly "vetted" and advice given where necessary.

What I have said would appear to be an indictment of the veterinary student. This is not intended. It is an attempt to draw attention to the moral duties and responsibilities which the schools and teachers owe to future members of the profession and also to point out the responsibility the student owes to himself and his future calling. The veterinary student to-day is sound good material, perhaps better in many respects than ever it was, and invariably becomes a credit to his profession. With an overcrowded curriculum, perhaps we in advancing years expect too much—more than we gave ourselves. Perhaps we ought to be content to dispense a "licence to learn" and leave the rest to post-graduate development.

. . . . .

II.—By E. WYNN JONES

BRISTOL

Prior to discussing the essential divisions, *i.e.*, lectures, demonstrations and practical classes, of any course in veterinary surgery, several questions regarding general policy require consideration. Veterinary surgery may be taught systematically or, since it concerns several animals, may be divided according to the animal or group of animals. The process is the same whatever the animal and it would seem wrong that a subject such as obstruction of the bowel should be discussed on two separate occasions, *e.g.*, as foreign body of the small intestine in the dog and torsion of the intestine in the horse. Separation of such processes does not assist the student to appreciate that surgery is but the application of subjects previously taught. On the other hand, the present tendency to establish field stations is inclined to encourage division of the course into two (namely, small- and large-animal surgery). Such division may also follow as a result of the experience of the clinical teachers having been limited either to small- or large-animal diseases. Surgery largely concerns the treatment of the individual. Similar disorders of the individual discussed under veterinary medicine might well be grouped with a systematic course in surgery. The establishment of a department in clinical studies by some schools encourages such a view.

When considering the lecture, one's immediate thought is that so many lectures deteriorate into a period of dictation. Such instruction on an abstract level results in a prevalence of learning confined to the use of words without any corresponding richness of meaning and should be avoided at all costs. An alternative to the formal lecture is the informal lecture which encourages class discussion, thought and

interest. This form of instruction, however, is of little use unless the student has previously had some concrete experience of the subject under discussion, and is facilitated by issuing a typewritten synopsis which co-ordinates the material discussed.

Surgery, as is any clinical theme, is largely a practical subject, and therefore should be taught by giving the student some definite experience of the condition. If this cannot be done as a practical class or demonstration, then at the least some form of illustrative material should be used. Until the student has definitely experienced the condition or procedure (or a similar one), he cannot fully appreciate a verbal description. Such experience may have been obtained while seeing practice during vacation or can be assisted by the use of one of the many visual aids, such as demonstrations, museum material, motion pictures, still pictures and graphic material.

To adopt the above policy, it is essential that the provision of clinical material should be adequate. Methods for providing such material in use by various schools include the following :—

(*a*) Ambulatory and out-patient clinics;
(*b*) Consultations with members of the profession;
(*c*) The use of material provided by a restricted number of farms.

Whatever the method or methods, it should never be overlooked that their primary object is to provide material for teaching. While this clinical material may be demonstrated on the owner's premises or in the out-patient department, it cannot be emphasised too strongly that material which is hospitalised is by far the most valuable for instruction. In the hospital the student can make daily examinations of the case and can even assist with some of the routine treatment. He is thereby able to follow the entire course of the condition. There is no doubt that a verbal description of technique is wearisome and of little value to the student without correlation with any definite experience.

Before turning to the use of the film it is important to recall the basic education principles, namely, to explain the demonstration briefly beforehand, to emphasise the main stages throughout and not to allow these to become obscured by detail, to be sure that all students see and to avoid hurrying or prolonging the procedure. In addition, it is an advantage to supplement the demonstration by subsequent discussion and a typewritten synopsis.

Recently attention has become focused upon the motion film, the popularity of which has increased owing to greater facilities for " home production " and the advent of colour. It should, however, be emphasised that the value of the motion picture as a teaching aid is superior to other aids only in those instances where it is essential to grasp the nature of movement. In addition, it provides an easily reproduced record of the entire course of a case. So far as depicting motion is considered, one thinks of its value in teaching the abnormalities of locomotion and the analysis of these by slow motion photography. In comparison with verbal methods it has been shown to be 10 to 30 per cent. more effective, with a greater retention of knowledge and permanence of learning. It has been shown, however, that the demonstration is superior to the use of the film in teaching manipulative skills. Generally speaking, under such circumstances the more real the material and method, the more effective the learning. Direct experience is usually preferable to the film, which should not be used when other equally effective but less expensive devices are available. Other pitfalls of the motion picture are the suggestion of over-simplification and the development of wrong time notion. When considering the respective merits of the silent and the sound film, it should be remembered that the silent film is more flexible. The latter, on the other hand, is considered by some to be antiquated and a disappointment to students used to sound. The use of the motion film for teaching veterinary surgery would appear to be indicated for teaching abnormalities of locomotion, for the revision of cases and manipulative procedures, and for teaching cases which could not be demonstrated. As far as operations are concerned, the film strip (although it lacks action and motion) competes quite favourably with it. Films available for teaching veterinary surgery are few ; some very excellent films have recently been made and many institutions are following this lead. Such films, however, do take a considerable time to make and it would seem to be a good idea for institutions making such films to form a committee for guidance and technical information and to avoid unnecessary duplication, until a reasonable selection of films is available.

To revert to the film strip, as already stated this can be useful—especially for showing the stages of development of a condition, or for contrasting and comparing. Film strips are especially convenient, owing to their size and comparative cheapness. They can be used for revision or explanation of demonstrations, for integration with a cine-film and for the illustration of the stages of an operation. Finally, it should be remembered that graphic materials should not be ignored, for a diagram, for instance, can often illustrate that which is not readily apparent in a photograph.

Part of the surgery course which is a problem to the teacher is the teaching of both manipulative technique and the technique of specific operations. Techniques should be taught entirely by means of practical classes and demonstrations correlated by various visual aids. Some medical schools have recently adopted this method. Operative techniques are surely best taught by operations upon the cadaver, and by demonstrations supplemented by illustrative material including notes, diagrams and films. What appears to be an unsurmountable problem is that of teaching the handling of living tissues. Some teachers believe that a description of operation techniques should be included in lectures and that it should be left to the student to perform them on the cadaver upon his own initiative.

To conclude, it is suggested that the teaching of veterinary surgery should be less formal than at present, that greater use should be made both of practical classes and demonstrations, and that lectures describing operation techniques might well be omitted. In addition, clinical courses in general would benefit from a greater integration with pre-clinical subjects, by the establishment of clinical courses in such subjects as anatomy, by clinical forums and by overcoming the tendency of the field station to become an entirely separate unit. When the veterinary student can be made to appreciate that his clinical course is but largely the application of that which he has been taught previously, then some advance will have been made. At present he usually realises this at too late a stage to make adequate use of his pre-clinical teaching.

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Operative Procedures—Large Animals

By J. McLINTOCK,
Norwich

As a practitioner, I propose that my remarks shall deal with some of the commoner surgical operations which can be carried out by the veterinary surgeon in general practice, working as he often does without skilled help, and under difficult conditions. However, most operations can be performed thus, although for caesarean section in the bovine, it makes things easier to have one skilled assistant who can

scrub up and lend a hand during delivery of the foetus and subsequent suturing.

First of all, I must mention anaesthetics, as no surgeon can do his best work unless the patient is efficiently anaesthetised. In my opinion, chloroform is not a safe anaesthetic for bovines, both on account of its immediate toxic action, and because of its delayed effect, with an occasional fatal sequel sometimes a few days or even a week after its use. For horses, however, it is still the anaesthetic of choice, and it can be given for comparatively long periods without apparent ill effect. When administration ceases, the patient is able rapidly to regain its feet, which in equines is very important.

Anavenol K is my anaesthetic selection for bovines. Induction is very rapid and anaesthesia can be maintained by periodic administration. There appears to be no ill effect afterwards. I like to use it in conjunction with local infiltration anaesthesia for long operations such as caesarean section, as this will allow the final suturing to be completed under narcosis, thus saving anaesthetic. I do not advise Anavenol K for horses owing to the barbiturate "hang-over" which causes staggering and falling when the patient attempts to get up.

Chloral hydrate intravenously is useful in both horses and cattle. I have used Thiopentone by rapid intravenous injection in horses for short operations, but there is still the criticism of inco-ordination on rising.

Of local anaesthetics I prefer 2 per cent. Procaine. It is equally useful for epidural anaesthesia, nerve block and local infiltration, the advantage being that for the last named large quantities may be used without fear of damaging the tissues and interfering with healing. For rumenotomy I use 150 to 200 c.c. of 2 per cent. Procaine subcutaneously, intramuscularly and into the peritoneum, and for this, I definitely prefer it to some of the newer anaesthetics which are liable to cause skin necrosis even if used in one-third of these quantities. When firing tendons in horses it is quite important to use a weak solution of Procaine to avoid the possibility of local reaction and sloughing.

At this point I would like to mention the sutures which I consider to be most valuable for everyday work. When suturing the rumen I use No. 2 chromic catgut and a straight, round-bodied needle. The first suture is a continuous Connell, and this is overlaid with a continuous Lembert. For the uterus a single row of continuous Lembert sutures, using No. 3 chromic catgut, is sufficient, and for muscle a continuous No. 3 or 4 chromic catgut suture is used. I think it is an advantage to use it doubled for this purpose, on a stout 4-inch curved needle. Number 8 nylon, in the form of interrupted sutures, is recommended when suturing skin. Bovine skin is tough, and a sharp 4-inch curved cutting edge needle used with a pair of strong needle holders makes the job easier. A needle with the Paterson eye through which the nylon is threaded twice, will ensure that the suture does not part from the needle when in use. Mattress sutures are used for skin alone, but when muscle is to be included as in flank suturing, the Gould eversion suture is employed.

For teat wounds in which the sinus has been entered, a suture very similar to this is used, and simple interrupted stitches are placed between.

Efficient sterilisation of all instruments, swabs and drapes is essential. For this purpose the ordinary portable fish kettle steriliser is quite adequate if boiling is carried out for 15 to 20 minutes. Sharp instruments and needles are kept in a non-rusting solution of an efficient antiseptic. Instrument trays may be sterilised by swabbing with a concentrated antiseptic, which is then washed off with boiled water from the steriliser just before the tray is required.

I rarely use rubber gloves for large-animal surgery, as many of the procedures involve inserting the hand and arm into the abdominal cavity. The nails are kept short and the hands and arms scrubbed for at least five minutes with soap and antiseptic solution.

To proceed with actual operations, I will deal first of all with the bovine, which is popularly considered to be a subject on which the surgeon can get away with anything. The fact that the tissues are fairly resistant to the effects of surgical interference, and the peritoneum possesses great ability to localise and overcome infection, need not be an excuse for crude or slovenly surgical procedures. As a preliminary, the skin should always be clipped, shaved, cleansed and disinfected. Whilst it is impossible to be completely aseptic when opening the rumen or uterus, methods should be employed to minimise contamination from these organs. To this end, draping and efficient "packing off" should be carried out, and frequent washing of the hands and arms resorted to during the operation.

In rumenotomy I use a special tube, which when inserted into the rumen wound and doubled back over a rubber drape, completely isolates the interior of the rumen from the abdominal wound and the peritoneal cavity. When suturing the rumen wound, the latter is held in position, and closed, by means of a specially designed rubber-covered clamp. By the use of these methods the external wound heals by first intention, and local peritonitis is cut down to a minimum. Those who advocate suturing the rumen to the parietal peritoneum with a continuous suture at the commencement of the operation, and leaving it so attached afterwards, pre-suppose that the final result will be peritonitis with adhesions, no matter what method is used. That this is by no means true has been demonstrated on subsequent *pos'-mortem* examination, after use of these improved methods.

I consider caesarean section in the bovine to be well worth doing in general practice, and to be fraught with less danger to the patient than extensive embryotomy or forced traction. The indications I would say are—gross oversize of the foetus, deformity of the pelvis, non-opening of the *os*, some cases of *schistosomus reflexus* and irreducible uterine torsion.

I prefer the midline site, having always found that this allows easier access to the foetus and simplifies suturing afterwards. However, the abdominal sutures have to be very carefully laid if the risk of post-operative hernia is to be avoided.

I do not consider pericardotomy for relief of traumatic pericarditis is an operation which is justified. The chances are against recovery as it is impossible to seal off the pericardial wound from the pleura, and a very painful pleurisy must result.

A minor operation which is frequently performed, is dehorning under cornual nerve block. I find that the best instrument for this is the butcher's bow saw. The horn is cut in an upward direction from above the ear, and a flap of skin removed all round, no attempt being made to control haemorrhage. I think rough clipping of the surrounding hair and wetting with antiseptic solution is worth while before commencing, as this reduces the amount of hair and dirt which is forced into the sinus by the saw. I have found that dehorning shears do not get close enough to the head, with the result that small stumps grow afterwards. Haemorrhage is also more severe after their use.

Amputation of the digit is another simple operation, which, however, is best done under general anaesthesia. In my opinion, the making of skin flaps is a waste of time, and hinders healing. I prefer to cut straight down to the second phalanx above the coronary band, and then bisect that bone

with a tenon saw. The wound is bandaged tightly and not disturbed for 48 hours ; thereafter it is dressed daily.

Suturing teat wounds should always be performed carefully if the teat canal is involved. For this, local anaesthesia is sufficient. Where a teat is blocked at the orifice, the crucial incision, using McLean's knife, is much preferred to attempting to keep it open with the teat siphon ; in fact, the practitioner should forbid the owner or cowman to use teat siphons for this purpose.

A quick method of amputating the udder which is worth while trying in cases of acute gangrenous mastitis which would otherwise prove fatal, was described in a Symposium of Bovine Mastitis (Plastridge & Little). The blood supply to the udder is cut off by ligating the mammary artery on either side, and the teats are amputated. The flow of toxins from the udder into the body via the extensive venous system is diminished greatly, and rapid improvement of the general condition results. The udder atrophies.

In these days equine patients are few and far between in general practice. The commonest operation, no doubt, is castration, and I think the standing operation with local anaesthesia into the cord is the best method of approach, using the Hausmann Dunn emasculator.

Ruptured colts are cast and chloroformed, and I find the old-fashioned wooden clams applied over the tunica vaginalis are very satisfactory. Some will say this is not a true surgical procedure, but I would defend the method on account of its speed and simplicity, and the good results obtained. This also applies to the use of wooden clams for umbilical herniae. Cryptorchid castration is within the scope of the general practitioner, and can only be learned by trial and error.

Poll evil and fistulous withers respond best to the excision of a portion of the ligamentum nuchae to expose the infected bursae. However, the wound is so large that healing takes a long time. In some cases good results have followed the use of *Brucella abortus* vaccines. In canker of the foot, ruthless excision of the diseased tissue under general anaesthesia is sometimes successful.

In the ewe, the only operation worthy of note is caesarean section. This is a simple procedure and is worth while carrying out. It can be done under local or general anaesthesia.

Although this list of operations is by no means exhaustive, I feel that sufficient has been said to indicate the scope of the surgeon's work in general practice.

Operative Procedures : Small Animals

By S. F. J. HODGMAN,

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Before undertaking any operation the surgeon should give due consideration and thought to the nature of the operation, the possible post-operative difficulties, and finally the individual ability of the patient to stand it.

In making these calculations the surgeon should enquire into any previous illness or accident from which the patient may have suffered, its nature, severity, and probable influence on the patient's chance of recovery following the operation.

Also before any major operation, except of course an emergency, the patient should be fed and treated in such a way as to get it into a state of health most suitable to withstand the effects of the operation, a precaution that is too often neglected. Especially in the case of household pets this end is best achieved in the animal's home. Pre-operative care and treatment can be carried out by the owner if he is of moderate intelligence and the reasons for such precautions are clearly explained to him.

Diagnosis.—This is of paramount importance, and we are fortunate to-day in possessing many more aids to diagnosis than were at the surgeon's service even 10 years ago. From the surgeon's point of view the most important aid outside the laboratory is X-ray. Many in small-animal practices are not so lucky as to possess their own apparatus, and of those who do, many use them only for screening.

To take and develop pictures is time-absorbing, and it is often more economical to get someone else to do the work. Besides, it is a matter of routine for the radiologist and he may be trusted to get better results than an amateur could do.

Confinement and Restraint.—Especially in the case of household pets, a minimum period of close confinement is desirable. During examination by the surgeon there is much more skill than is generally recognised in the correct restraint of an animal, and some assistants never acquire it. An animal is quick to realise if the assistant is afraid of it, and even quicker to take advantage of the fact. Women, in my opinion, are better at this work than men ; possibly they are more tolerant and more gentle in their approach.

Pre-Surgical Care.—For the most part this consists in preparing an animal according to its individual characteristics for a definite surgical procedure. In saying this I am not considering the financial side ; that must, of course, be taken into consideration. Hard-and-fast rules cannot be laid down ; briefly, the surgeon must consider his reasons for operating, which are :—

(1) To save life.
(2) To eliminate a disease process.
(3) To induce a complete recovery from injury.
(4) To remove the results of a disease.
(5) To produce compensatory functional results.
(6) To alleviate symptoms of disease.
(7) To correct malformations induced by an injury.
(8) To make an animal sociologically and economically acceptable.

Personal.—It is seldom that the veterinary surgeon has more than one assistant even for the most serious operation, but, if it can be arranged, a team of three, including the surgeon, is advisable and greatly facilitates the work. The main trouble with our surgery is that the remuneration from fees is usually so low that it is uneconomic for a G.P. to maintain a properly-trained staff and so to keep such a team together. Careful planning, however, can overcome many obstacles and the main principles, more or less modified, can be adopted.

Operating Room.—A special operating room, to be used exclusively for surgical cases, is desirable in every small-animal practice.

Equipment.—This includes operating table, instruments and case in which to keep them, anaesthetic apparatus, towels, drapes, gloves, etc. The success of any operation depends not only on the skill of the surgeon but upon the care exercised before, during, and after the operation. In veterinary surgery, where there is usually a minimum of trained personnel to draw on, simplicity must be the watchword, but this does not excuse inattention to the main principles of asepsis, etc. If the training at the veterinary school has been thorough, then the surgeon is more able to modify and adapt his methods to suit the circumstances under which he is often made to work.

Instruments.—Instruments are best placed on a portable table or trolley covered with a sterile cloth and with a similar cloth laid over them until the surgeon is absolutely ready to use them. Simplicity should be the guiding principle of operative procedure, but on the other hand, before commencing, one should make certain that all instruments that may possibly be needed are prepared and placed in readiness :

it is better to have too many than too few. Naturally, the type and size of instruments must depend on the surgeon's individual choice and habit.

Sterilisation.—In this connection great care should be given to instruments ; before sterilisation they should be clean and free from rust. Clean instruments completely submerged in water and boiled for 15 minutes can be regarded as free from organisms. Personally, I always boil all instruments with the exception of scalpels and scissors—drapes and swabs, etc., can be autoclaved. If the surgeon does not possess an autoclave, a three- or four-tier steam cooker, properly used, will answer the purpose and costs a great deal less. It must be borne in mind that the cooker is not a 100 per cent. safeguard, especially against spores, unless it is kept boiling for two hours. Gowns need only be freshly laundered. I found it a useful system to prepare bundles for sterilisation so that the operator knows what is in each bundle and how it is packed. In fact, a system of general preparation should be worked out covering the preparation of the patient, of the operating room, of gowns, etc., of instruments, needles and suturing materials, of swabs and gloves, the whole to be modified and altered to conform with the individual technique of the operator and the training of his assistants. And here let me put in a word of warning about gloves—see that they fit. Nothing is more annoying than to work in gloves that are too big, and it is equally difficult and even painful to attempt an operation in gloves that are too tight. The fundamentals of aseptic surgical technique have been known for some time and are extensively, I may say universally, practised in human surgery. In my opinion, small animal surgery demands the same precautionary safeguards as are practised as a matter of course in human surgery.

Antibiotics.—Of course these have revolutionised surgery, but they must always be used with discretion and in conjunction with good technique.

Preparation of Patient.—Preferably, this should be done in some room other than the surgery. It is a common mistake to remove too little hair : see that the assistant clears a wide field for the operation. Clippers do less damage to the skin than does a razor ; scraping with a blunt razor is most undesirable. If possible, this should be done the day before.

Secondly, immediately before taking the patient into the operating room the site of the operation should be thoroughly washed with soap and water. The site can then be treated with alcohol ; when this has dried, treat with an antiseptic.

Draping of Patient.—There are several kinds of drapes and each surgeon has his own particular choice, but one general rule can be laid down—have enough and have them big enough. Nothing is worse than hairs bobbing up and contaminating the wound, etc.

Anaesthesia.—There is no time to discuss this vast subject now ; all I can say is that, as you know, there are a variety of agents and many methods in common use. All are reasonably safe and effective if correctly used. No hard-and-fast rule can be laid down as to what anaesthetic should be used ; often one's choice depends on the kind of operation to be performed, the age of the animal, the kind of animal, the past history of disease or accident and the number of assistants available. I must emphasise the condition of the patient and the type of operation to be performed. The common methods of anaesthesia employed in canine practice are :—

(1) Use of inhalation agents.
(2) Intravenous injections.
(3) Infiltration of a local anaesthetic.
(4) Use of an anaesthetic that will bring about a nerve block.

Morphine is often used as a pre-anaesthetic agent, and in this connection one must remember there is a breed reaction to this drug. While the type of anaesthetic used must, of course, be left to the surgeon to decide, it is always wise to have at hand antidotes and restoratives in case they should be needed.

I cannot leave this subject without mentioning intratracheal anaesthesia. This is becoming more popular in canine work and has outstanding advantages both in accurate administration and in allowing of quick restoration should respiratory failure occur. The main objection to it is probably the cost of a positive pressure machine, but if a lot of surgery is being done this will soon pay for itself.

Sutures and Ligatures.—These again are matters of choice ; the ideal material has not yet been found. From the surgeon's point of view the still unrealised ideal is something that will give as little tissue reaction as possible, can easily be sterilised, is strong and easy to handle, will not come untied and, finally, will not hamper healing.

Manipulation of Sutures.—This is an art and should be practised often. Apart from the essential dexterity involved, knot-tying with the right amount of pressure is very important indeed. Every surgeon develops his own style and they are all equally good providing they give satisfactory results. It is a matter of individual technique. Correct technique, however, is of the greatest importance and can only be acquired by practice. A suture, while being tight enough to answer its purpose, should never be so tight as to cause necrosis.

The Operation.—No major operation should be undertaken without thoughtful anticipation of every essential detail—what technique is to be adopted, what instruments will be required, what dressings, drapes and swabs, what kind of needles and suture materials, what restoratives must be at hand in case of collapse, etc. Remember also to take into consideration the number of assistants you will require, or who are available, and whether or not they are to be properly scrubbed up. The conscientious surgeon guarding his client's interests and his own reputation, will not undertake difficult surgical cases, except of course in emergencies, unless he has all the aids to success at hand. " The operation was successful but the patient, unfortunately, died," is an odious epitaph, and one that carries reproach unless the surgeon is entirely satisfied that every possible precaution has been taken.

Consideration of Post-Operative Care.—This, in my opinion, is essential and in veterinary work it is too often neglected or, at best, not sufficiently regarded. It is important to begin restorative treatment before the mechanism of compensation becomes ineffective.

Shock is usually associated with blood volume loss, and treatment may consist of the use of oxygen, serum, plasma or whole blood.

Occasionally post-operative pneumonia may supervene, but this may usually be avoided by good post-operative care, *i.e.*, keeping the patient warm in an even temperature. Inexperienced attendants should be warned against burning the patient's skin with artificial heat (stone hot-bottles may easily be responsible). Abdominal binders, if used, should interfere as little as possible with respiration. The body of an unconscious animal should be frequently turned. If there is haemorrhage from the mouth, see that the head is lower than the hind quarters and lungs. Water balance is also of great importance. Following most operations the natural intake of fluids is cut off and is restricted for a few days after the operation, but the output by natural bodily elimination continues. Unless the body is supplied with salt, fluid dehydration will develop.

During convalescence there is an increased need for the dissipation of water owing to the increased metabolic activity of the body, especially when shock is present. Absorption of fluids via the mouth is naturally the most satisfactory method of making up the deficiency, but some operations necessitate withholding fluids by the oral route for a few hours or days after the operation. In such cases subcutaneous injections may be given ; care should be taken, however, to see that the tissues are not over-distended : avoid trauma whenever possible.

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Research—I.—Experimental Surgery

By J. H. PEACOCK,
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Introduction.—It is very difficult in a short time to cover the whole subject of experimental surgery and its relationship to the other clinical and basic sciences, and it is not the purpose of this paper to go into the details of experimental work which is being undertaken in human surgery throughout the world to-day. I would like, however, in this short time to comment in general terms on the changing place of experimental surgery in the general relationship of the field of clinical surgery to medicine and the basic sciences, taking into consideration the tremendous advances which have been made in the treatment of disease generally. As a result of my own experience, both in this country and more recently in North America, I would like also to put forward some personal observations in regard to both the undergraduate and post-graduate training in the general field of surgical research.

Historical.—In considering the trend of experimental surgery one must accept the fact that the practising clinician, be he physician or surgeon, has always been dependent largely on factual knowledge derived either from the observation of clinical cases or from the study of the basic sciences of anatomy, physiology and pathology, these all being used in their broad conception. Observation has been practised for many centuries and the general structure of both the human and animal body has been known for a very long time, but neither of these produced any rapid advance in the treatment of clinical disease. It was not until in the late 18th and 19th centuries that the scientific era of Koch, Pasteur and Claude Bernard, by developing the experimental method to elucidate the factual basis of human physiology and pathology, suddenly provided the impetus for the development of modern medicine as we know it to-day.

Hand in hand with this acquisition of fundamental knowledge came the development of clinical surgery. This was used to correct the various forms of pathological anatomy and disordered physiology that were discovered, as new facts concerning the aetiology of disease and the function of organs were established and understood. With the advent of the Listerian era of asepsis the missing link in the rapid development of surgery was found and advances in anaesthesia, intravenous therapy and antibiotics have merely added to its scope, so that to-day no part of the body remains unexplored. From this rapid and very cursory analysis of the development of surgery the role of experimental surgery during the last century can be made out and when examined is found to fall into two main groups :

1. First and foremost, with the increased knowledge of clinical surgery the need arose for the development of a large number of standardised operative procedures to enable diseased organs successfully to be removed and a great deal of energy was expended to discover the advantages and disadvantages of various types of incision, suture material and anastomoses, together with the creation of surgical instruments to facilitate the various purely technical procedures which were in process of being developed. From this mass of endeavour and observation arose a number of procedures which have been accepted as standard operations, and to-day these form the basis of clinical operative surgery all over the world. It is this group, which can rightly be described as the technical development era of operative surgery, that tended to progress more rapidly than the second group which dealt largely with the development of the basic sciences.

2. Coincidentally with technical development came the rapid investigation of the basic physiology and pathology of both the healthy and the diseased patient, and the need for the creation of pathological conditions by surgical means arose, so that the resultant facts, together with the effects of standard surgical operations could be observed. These procedures were carried out mainly on animals in the laboratories of the great physiologists and pathologists, and from them came most of our present knowledge concerning the working of the major systems of the body together with the basic processes involved in the pathology of trauma, inflammation, repair and neoplasia.

As a result of the emphasis on the technical development of clinical surgery, this branch now seems to have advanced further than our knowledge of basic physiology and pathology and may well be said to have almost reached its ultimate. Operations practised in man to-day on such organs as the stomach, gall bladder, thyroid, kidney and colon have changed little during the last 25 years and only in the field of neurosurgery and thoracic surgery have new procedures appeared. Indeed, even in human thoracic surgery operations on the lungs have largely become standardised, and cardiac surgery, only recently regarded as feasible, is rapidly being explored to such an extent that within 10 years most of the possible operations probably will have been performed and become routine. An effective extra-corporeal circulation, now almost perfected, is probably the last step in this development, and already has been used with success in a small number of human cases.

From this analysis it can be seen that progress in human surgery is becoming increasingly limited by lack of more complete understanding of human physiology and pathology and not by technical deficiencies, hence I believe that in the years to come it is in these fields that experimental surgery will have its most important place. This fact has stimulated the clinician himself to try to acquire knowledge of the normal and abnormal metabolic changes that occur as a result of operative procedures, and hence a definite trend towards the adaptation of the relatively new sciences of biochemistry and biophysics to the study of the human, as distinct from the animal, subject is discernible. It has been found that such investigations as cardiac catheterisation, angiocardiography, electroencephalography, electromyography, hepatic, renal and peripheral blood flows, together with the use of radio-active isotopes can yield a wealth of factual information with little risk to the human patient. It should be clearly understood, however, that these investigations should be used only where the clinical condition of the patient necessitates their employment and that under no circumstances should they be used unless there is this clear-cut indication. For a number of reasons the clinician has not always been able to obtain these facts from the pure physiologists or morbid histologists and as a result this has led to the development, particularly in America, of research buildings situated immediately adjacent to the main hospitals which are concerned purely with the investigation of human physiology, all available scientific

resources being concentrated into a single building. Animal facilities in these centres, which are designed for basic research into clinical disease, are now subsidiary instead of, as formerly, being the main line along which research progressed. The effect of such procedures as the creation of an Eck fistula on all aspects of liver metabolism ; closure of septal defects on pulmonary and cardiac blood flows, or the normal or abnormal response of the body to the stress of operation can be observed fully and analysed. It can therefore be seen that experimental surgery has tended to pass away from the stage of technical development and more and more to enter the realms of medicine and the basic sciences. This brings the clinician more closely into contact with the basic research worker—particularly the physiologists, biochemists and biophysicists. It is in these latter two fields, together with their special subgroups, that I feel the future of surgery lies. Just as it is true that a large number of clinicians fail to realise that adequate follow-up of cases will record mainly the results of treatment rather than the aetiology of disease, so those working in the basic sciences should take advantage of this present trend in clinical surgery and utilise effectively the tremendous amount of material available for such specialised investigation, once the initial investigating procedures have been established as being free from any undue risk.

At the moment, surgery, for want of a better method of treatment, is being used to treat many forms of what were until recently regarded as being purely medical diseases : Hypertension—both portal and systemic ; cardiac disease —both congenital and acquired; ulcerative colitis; thyroid, pituitary and adrenal hyper-function are all examples of this. It should also be realised that this is but a temporary phase and that ultimately the prevention and cure of practically all disease will be by other than surgical methods. Only the successful transplantation of organs lies ahead before surgery well may assume less and less importance in the treatment of disease.

Physiology, Biochemistry and Pathology.—In physiology, biochemistry and pathology the role of experimental surgery is largely unchanged. Procedures designed to elucidate basic facts that cannot be obtained without risk or hardship from the investigation of human patients must still be evolved by experiments on animals. Such procedures are exemplified by the effect of adrenalectomy and hypophysectomy on tubular reabsorption of the kidneys or the use of antigens to combat the hypersensitivity induced following homologous lung transplantation. Examples such as these can be multiplied many times in every field but they illustrate that surgical operations in these fields are but necessary incidental procedures to create certain pathological states as a result of which basic investigations can more easily be carried out. Such operations, I feel, will always be necessary and indeed are assuming increasing importance as research in all fields becomes centred on the fundamentals of cellular metabolism in all its aspects.

Research in Undergraduate and Post-graduate Training.—I am often asked my opinion on the role of research teaching in undergraduate and post-graduate training. I feel that in this country too little emphasis is placed on the acquisition of knowledge by students for themselves, the majority of these being subjected to a mass bombardment, by either lectures or demonstrations, of purely factual information. Students, I believe, would become much better informed if they were taught to ask and be asked the question " why ? " and not " what ? " and it is in this connection and not in the acquisition of operative technique, as stated by Markovitch, that experimental surgery is most useful. It stimulates the mind to acquire information by personal knowledge and experience and promotes a mental driving force far higher than any other form of study. This principle applies to the post-graduate as well as the undergraduate worker.

Summary.—To conclude, therefore, I believe that experimental surgery, practised purely to improve the technique of human surgery or to evolve new operative procedures, is rapidly diminishing in importance and that clinical surgery now has reached the stage where it is limited mainly by lack of knowledge in other fields and not by technical facility.

The role of surgery in pathology, physiology and the other basic sciences is largely unchanged but there is present a definite trend, induced by the acquisition of safe scientific methods of study, towards the investigation of the human being in disease rather than the creation of disease in animal subjects. As a result of this trend the sciences of biochemistry and biophysics should, if possible, be linked more closely to the clinical fields rather than rely purely on the adaptation of surgical procedures to their own particular problems.

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Research—II.—Clinical Research

By GORDON C. KNIGHT,
London

When asked to consider clinical research in the light of advances in surgical techniques and methods, I feel I must first pay very humble tribute to the antibiotics. In the clinical aspects of operative veterinary surgery, aseptic technique can seldom, if ever, reach the standard of human surgery and it is my belief that the antibiotics have blessed the inception of whatever we, as veterinary surgeons, may claim to be included under the heading of recent surgical advances. Perhaps greater blessing has been given to those established and routine techniques which, still employed, now reward the veterinary surgeon with such a greatly reduced incidence of post-operative complications.

For my part in the symposium I am bound to consider what has been done in Beaumont Animals' Hospital and refer first to anaesthesia, although it would appear this subject is not strictly within my scope to-day. Barbiturate anaesthesia, in connection with which we have to be thankful for the work of Professor J. G. Wright, allowed some big strides in surgery during the past 20 years but, while not in any way neglecting the advantages of the drug in comparison with the anaesthetic techniques it largely displaced, there can be no doubt the barbiturates themselves are far from suited to all anaesthetic requirements. Our own experiences over the last four or five years have shown that the barbiturates fill their best place in premedication and induction, although of course thiopentone sodium still remains of great value where short action only is required. Happily, I believe, the trend is now premedication, induction and the endotracheal administration of anaesthetic gases, making full use of closed and semi-closed circuits and the Boyle's apparatus as a whole. In clinical operative veterinary surgery there is every scope, if not demand, for the employment of anaesthesia suited to the operation and to the animal's physical condition. Therefore, if surgery is to progress in the clinical field, we must encourage research and specialisation in anaesthesia. Here it is proper that I should give as an example the recent valuable work of Mr. L. W. Hall at the Beaumont Animals' Hospital with anaesthesia and with related neuro-muscular relaxation and vascular hypotension.

The advance in surgery associated with clinical research which I think deserves first mention, is in the treatment of

bone fractures. Apart from some occasional attempts at internal fixation with such materials as silver wire, heterogeneous and even autogenous bone grafts, up to a few years ago fracture treatment commonly amounted to the application of inadequate conservative methods in the full knowledge of their inadequacy and with faint, if any, hope of success. The position of small-animal fracture treatment was in fact at a standstill. However, a lead which had demonstrated the inert nature of stainless steels and similar alloys in living tissues was followed and, by the kindness of Mrs. Robertson, M.R.C.V.S., we were able to investigate the use of a Stader type splint. Although no longer employing this method, we acknowledge gratefully the object lesson it gave in the possibilities of stainless steel as an internal splint.

From the experience and results obtained in about 270 major open reduction and internal fixation operations using non-toxic or vitallium plates and screws, transfixion screws, intramedullary pins and wire braces, I feel, at any rate as far as I am concerned, these methods have come to stay. Their popularity in a short time with veterinary surgeons in private practice points to the need there was for a rational and objective surgical basis for the treatment of fractures. The veterinary surgeon, whether or not he is prepared to undertake the operation, should now be aware that open reduction and internal fixation of the fracture is not a hazardous and formidable project but, in many cases, the right and practical course. An aspect of the matter which, I am sure, is of the greatest importance, is that the veterinary surgeon who can employ these methods will gain a better knowledge and insight into that type of fracture in the course of one open reduction than could be gained in a lifetime of experience with closed manipulations and conservative methods alone.

An example in this connection is the fractured radius and ulna of the dog, which usually resists all attempts at closed reduction and is the commonest site for both mal-union and non-union. The incarceration of soft tissue in the fracture site is the direct cause of non-union, but to see the picture as it should be seen, to appreciate the difficulties objectively and overcome them, open reduction is a necessity. The old objection to making a comparatively simple or displaced fracture into a compound one can no longer be maintained, as, with the support of suitable antibiotics, open reduction technique is very rarely followed by serious post-operative infection.

A fair range of internal fixation operation instruments is already available, but we still need a variety of both instruments and fixation appliances specifically designed for the small animal rather than adapted to it.

As to the large animals, I do not think open reduction and internal fixation of fractures yet promises any of the success we know in small animals. From my limited personal experience the problems appear to be in the provision of a safe and prolonged deep plane of anaesthesia with good relaxation, but more particularly in overcoming the operative and post-operative mechanical difficulties. Only after attempting the open reduction of a long bone fracture in a horse can one appreciate something of the true nature of the task and its potential requirements.

The next field in which I think clinical research has produced results is thoracotomy in the dog and cat and, disregarding diagnostic explorations, I will refer to the two common reasons for opening the chest and to the provision of the essential controlled or positive pressure respiration, remembering that the mediastinal septum in the dog is such that this animal is generally regarded as having a single chest cavity. Collapse of one lung is necessarily followed by the immediate collapse of the other and this fact, of course, is responsible for the chest of the dog being forbidden territory to the clinician for so long by comparison with the impunity of laparotomy.

In my experience repair of the ruptured diaphragm presented the first clinical need for some form of controlled respiration—apart, of course, from whether the contemplated surgical approach was thoracic or abdominal—and after the failure of a few early attempts associated with air insufflation via a metal endotracheal tube, a very simple device revealed itself. This was a tube " T " piece, one arm of which was connected to a compressed air supply and the second arm to a cuffed endotracheal tube. The end of the third arm was intermittently opened and closed with the finger tip to inflate the lungs and allow deflation by normal recoil. This simple method allowed any gas mixture to be admitted and, naturally, varying proportions of oxygen and air were employed. At first with barbiturate anaesthesia it was found that the ruptured diaphragm could be repaired successfully by the abdominal approach, employing this easy method of controlled respiration. The need for a mechanical interruption to the flow of air and oxygen was soon satisfied by putting the problem in the hands of one who was able to produce a mechanised interrupter. The person concerned was Mr. C. R. Wood, a practising veterinary surgeon, whose name must be mentioned as having produced, as far as I am aware, the first simple compact apparatus for positive pressure ventilation of the lungs fitted with flowmeters and with full range variable controls of both volume and tide frequency. An interesting observation as the result of our use of intubation techniques is that the range of cuffed endotracheal tubes made for human purposes is inadequate for all dogs, and even for animals of 50 to 60 lb. in weight we need specially made tubes with diameters greater than the largest ordinarily available for man.

With a positive pressure ventilation of the lungs now on a reasonable and practical clinical basis there seemed no reason why the impasse of the impacted thoracic oesophagus should not be overcome. Long crocodile forceps could be used to relieve many impactions by extraction of the foreign body *per os*, but not all the animals survived, death usually resulting from septic mediastinitis and pleurisy, consequent upon oesophageal rupture. If transthoracic oesophagotomy were practicable this risk at least might be minimised, and we investigated a technique by which, after rib resection and wide retraction of the wound, we were able to incise the oesophagus over the impacted foreign body, remove it, and finally close the oesophageal wound and chest wall. This operation we now consider to be practical clinical procedure, which can be employed with incomparably less risk than the blind traction with forceps on a dangerously large and spiculated bone fragment incarcerated somewhere in the posterior thoracic oesophagus. In connection with this operation and the repair of the ruptured diaphragm, I must again refer to Mr. L. W. Hall's work, which has drawn attention to the value of the closed circuit anaesthetic technique in thoracotomy.

Another, although by no means new, field in which encouraging results have followed clinical research is extraction of the crystalline lens in the dog and we have been fortunate in having no shortage of cases suitable for operation. Clinically, the two very clearly defined reasons for lens extraction are cataract and luxation and it is with these conditions that experience has been gained. In the first place, however, it has been found that incision of the cornea is not best achieved with a Graefe knife but with scissors after puncture with a keratome, and further, that the generous length of incision required to permit expulsion of the lens is not necessarily the important factor in producing unfavourable post-

operative corneal reaction. More important in this respect is accurate coaptation of the wound margins by precise suturing. We have demonstrated satisfactorily that an intracapsular extraction in cataract is practicable after removal of the anterior face of the lens capsule and in such cases vitreous loss, providing there is no incipient luxation, need not occur. Thus there is good reason to believe that the uncomplicated cataract of the dog may be treated satisfactorily by lens extraction. The factor which is most important, however, is minimising operative trauma and, even more particularly, post-operative trauma.

The luxated but otherwise apparently normal lens is a common enough cause of glaucoma, hydrophthalmus and rapid onset of blindness in dogs, but again we have sufficient evidence in such cases to know that the operation may well succeed. In lens luxation in the dog the important surgical consideration is the early recognition of iridodonesis as an indication for lens extraction ; alternatively, the recognition of pathological changes associated with glaucoma, which have proceeded to a point precluding successful operation. The extracapsular technique is unavoidable in extraction of the luxated or luxating lens and thus some loss of vitreous is an almost certain accompaniment, but experience has shown that this does not prevent good function being maintained or regained.

As far as I am able to judge, the technique of lens extraction in man has proved itself largely unsuited to the dog and in my opinion our clinical research in this interesting sphere has provided at least some strong evidence of this. For example, in my experience, iridectomy is unnecessary to facilitate lens extraction and I believe is probably contra-indicated on account of the organ's vascularity.

It is impracticable for us to keep our patients quietly recumbent after eye surgery and I feel we must take this very much into consideration in investigating the causes of failure. More recently, however, I have made conjunctivo-plasty a means, not only of controlling bulb mobility, but of aiding the healing of the corneal incision. I am very hopeful that it may prove its value.

In conclusion, it seems to me that my contribution has been restricted to certain personal experiences, but I can only hope that the choice has not been uninteresting from your point of view.

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Future Developments

By J. HICKMAN,
CAMBRIDGE

From the remarks made by the previous speakers, it is obvious that surgical techniques and procedures have reached a very high standard. This means much to the safety and benefit of our patients. In fact, with the exception of the larger domestic animals, veterinary surgeons have invaded all organs and cavities, to the benefit of animals and owners alike.

When one studies the progress of surgery through the years one is struck by the high standard of surgical technique and daring that has at all times been maintained. Surgeons of the past have exploited to the full the knowledge of the principles accepted in their age. What are often represented as their shortcomings did not really exist because many of the fundamental principles which are accepted and commonplace to-day had yet to be unravelled by those engaged in research. In fact, I have little doubt that many of the basic principles accepted to-day will be looked upon in an entirely different light in the years to come.

The great advances in surgery have nearly always followed scientific discoveries in fields often far remote from surgery. To my mind, the turning point in surgery was the discovery of anaesthetics which immediately opened up vast new fields of exploration. As in other walks of life, surgery has had its share of false prophets. In 1874, Sir John Erickson stated : " The abdomen, the chest and the brain will be for ever shut from the invasion of the wise and humane surgeon." Hardly had these words been uttered when the work of Lister began to dawn on a none-too-receptive scientific world and when put into practice opened up a new phase and approach to surgery. Again, it is but a few years since the late Lord Moynihan stated, " The craft of surgery has in truth nearly reached its limit in respect both of range and safety." In the last decade we have all seen far-reaching advances made in thoracic, cardiovascular, and plastic surgery, to state but a few. These advances in many instances and in no small measure have been made possible or at least greatly assisted by the advent of the antibiotics. For the purpose of my task I think these brief remarks suffice to compare the standard of surgical practice of to-day in relation to the past. Surgeons have always taken advantage of discoveries in allied fields and even remote fields of research, and applied them to their daily tasks to the betterment of their patients.

The standard and practice of veterinary surgery has never stood higher than it does to-day. What the future has in store, what new fields will be developed to enable the veterinary surgeon to benefit his patients further cannot be foretold but, in my opinion, one thing is certain : if those engaged in veterinary surgery are to have a place in future developments, then, within their ranks active research in applied, allied, and basic problems must not only be carried out but encouraged.

Because I believe the fruits of the future are dependent on the seeds of research being sown to-day, and also that a training in research is the best safeguard against false interpretations, I make this my excuse for discussing briefly research in relation to veterinary surgery before speaking on future developments. Many are the definitions of research, but the one I like best is " Research is organised effort to acquire knowledge regarding natural phenomena." The principles of methods of research applicable to veterinary surgery differ in no way from those practised in other sciences.

Research may be carried out either by observation and the making of deductions or by the experimental method. By this latter method, instead of waiting for things to occur, the research worker makes them do so by arranging an experiment in the hope of finding a clue to his problem. Researches may be conducted either by individuals—which generally means a basic piece of work in a narrow field—or by a team of workers each bringing their specialised knowledge and methods of approach to the elucidation of the problem.

Whatever the research problem, certain fundamental principles of approach must be observed and probably the most important of these is the establishment of an adequate control. Unless this is done, incorrect deductions, useless papers, and unnecessary suffering to animals will ensue.

The most sought-after reward of research is to make a discovery. Many are disillusioned. But it should not be forgotten that training in research develops a spirit of adventure and what perhaps is more important, it develops the faculty of evaluation.

In our rapidly advancing profession many considered advances will prove to be false. The veterinary surgeon must

be able to differentiate between the true and the false in his reading matter, in reports received, in papers presented and, I would add, the vast mass of literature being disseminated by the commercial firms. In my opinion a training in research is the best training for evaluating correctly the new things being presented daily to the profession.

In regard to future developments, this is a very vast field and it will only be possible to deal with a selected few.

Anaesthetics.—Improved anaesthetic agents and methods of inducing and maintaining anaesthesia are continually being developed. During recent years the use of the neuromuscular and ganglionic blocking agents has come to the fore. The former permit complete muscular relaxation to be obtained in the lighter planes of anaesthesia. The administration to the patient of a minimal amount of the anaesthetic agent has obvious advantages, but the use of these agents is not without its dangers and further researches are required not only on their precise mode of action but also perhaps on their delayed or remote actions, before the balance between anaesthetic and neuromuscular blocking agent is regulated to a nicety. The treatment of fractures in the larger animals by open reduction and internal fixation is considerably hampered by inability to obtain adequate muscular relaxation. The use of these agents will greatly facilitate these procedures. The ganglionic blocking agents are the modern "tourniquets" permitting bloodless fields to be obtained. They are still very much in the experimental stage and much more information on their mode of action is required, but I have no doubt that eventually they will fit into their right and proper place and be of inestimable value to the surgeon and of benefit to the patient. A particulate suspension, "Anavenol," has been employed as an anaesthetic agent. Whatever are its merits for this purpose, there is no doubt that the injection of a particulate suspension that produces an ascending paralysis opens up a most interesting field in fundamental research and to my mind this subject deserves critical investigation.

Cardiology.—Investigations into cardiac disorders and correlation of the normal cardio-vascular phenomena warrant attention. Fundamental work on this subject is necessary, especially in the horse, in which cardiac disorders are of a definite economic importance. Elucidation of the underlying mechanism responsible for the various types of heart-block would make a study both interesting and profitable, especially so, as some of these conditions in the horse appear to be of little or no significance, whereas in man similar abnormalities, as recorded by the E.C.G., are viewed with grave concern.

Radiology.—I think that, by and large, the study of radiology has been generally neglected in the veterinary field. The introduction of high voltage units (120 kV and above) has brought much more of the larger animals within the range of X-ray diagnosis by its increased penetrating power coupled with a reduction in exposure times and has thus opened up new fields of application and research. It was generally stated that radiographs taken at 120 kV and above were exceedingly flat. In many instances this is true, but Clark and her co-workers have shown this to be due to increased scatter and that it can be remedied by increasing the grid ratio up to 16 : 1.

Physiotherapy.—From time to time various methods employed in physiotherapy are introduced to the profession, each as a "cure all," and generally in the treatment of lameness in horses. They have a short-lived popularity and disappear. This is a pity because they all produce specific physiological effects which can be used to advantage in selected cases. Generally speaking, these methods are employed to relieve pain ; they cause contraction of either individual or groups of muscles, raise the temperature of tissues and increase blood flow. The application of these methods should be investigated as a basic problem to determine what types of action they have on tissue ; once this has been established their usefulness can be evaluated and applied to appropriate clinical cases. Of recent years the use of microwaves and ultrasonics has received attention and their effects on living tissue are being studied increasingly. I feel sure that many conditions in animals might be relieved or alleviated by their application but I would stress that, in the first instance, their biological effects should be studied before indiscriminately exposing to these rays a large number of animals with an even larger number of pathological conditions. Unless this is done a lot of erroneous conclusions will result.

Transplantation of Organs.—It has long been the dream of surgeons to be able to transplant a normal for a diseased organ. Early workers found that the mere transplantation was not quite as successful as they had envisaged and the poor results obtained were credited to an inadequate blood supply. The work of Carrel on the anastomosis of blood vessels appeared to be the key to the problem but it was soon discovered that the perfection of this surgical technique was by no means the answer. However, progress to this end has advanced steadily and to-day skin, blood-vessel and corneal grafts are accepted surgical procedures. Research on the biological factors involved which prevent the survival of tissues when transplanted from one animal to another, taking into consideration blood groups, incompatibility, allergy, etc., will surely go a long way in elucidating this intriguing problem.

Orthopaedics.—The antibiotics have revolutionised the open reduction and internal fixation of fractures in animals and to-day, with the exception of the larger animals, the treatment of fractures has reached such a high standard that one wonders from which direction the next advance will come. I think it will be derived from studies devoted to obtaining a more precise knowledge of the healing of fractures, the reaction of bone to various foreign bodies and a renewed investigation of the problem of bone graft versus bone transplant. Work I have been doing leads me to believe that inert appliances for internal fixation may not be the most satisfactory on all occasions. Certain substances provoke a reaction which results in a thickening of the cortex—this type of reaction is not without its advantages. I can foresee the time when materials are selected for specific purposes in orthopaedics because of the tissue response they will provoke.

In conclusion, I will reiterate that in my opinion future developments are dependent on the research of to-day and if we are to play our part we should put the emphasis on basic rather than applied research. The former is often considered of little value but the results provide a basis for years of progress by means of applied research which in itself often gets credit out of all proportion to its true value. For too long we have tagged along behind, applying the practices of and procedures from other sciences. No longer must we look upon our problems as purely veterinary but rather as general scientific problems the correct investigation and evaluation of which will add to the general pool of scientific knowledge and understanding.

The high standards attained in surgical techniques and procedures have greatly reduced the romance of surgery and the adventurer in surgery has to turn his attention to ever-decreasing and narrower fields, but I feel sure that many years will elapse before the science of surgery, which deals with the failures of medicine and preventive medicine, has no part to play.

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Summary and Conclusions

By G. H. ARTHUR,
Streatley

I think you will all agree that to-day we have enjoyed a surgical feast. My task was designed to aid the digestion and assimilation of the material with which we have been presented. I will liken its probable effect to that of a carminative—a drug of rather nebulous action—and leave it at that. An advantage of the rôle is that it carries a certain licence and there is no right of reply to my remarks.

It will probably be best to deal with the day's proceedings in a different order from that in which they appear on the agenda paper. I will therefore refer briefly to the development of veterinary surgery, then consider modern surgical practice and its scope; this will be compared with human surgery and afterwards the status of veterinary surgery will be assessed. Next the needs and future development of veterinary surgical practice will be considered and finally I will touch lightly on the way in which they should be arranged so as to meet modern needs and future trends in the practice of veterinary surgery.

The most noteworthy deduction from the papers dealing with operative procedures and clinical research is the tremendous advance which has been made in veterinary surgery during the last two decades. This has been due to improvements in techniques, including methods of anaesthesia, to specialisation and to economic factors. At the turn of the last century veterinary surgery comprised, to a large extent, castration and its complications, methods of counter-irritation, lancing of abscesses, operations on the horse's foot, occasional neurectomies and dental operations. The interferences were mostly on superficial organs and restraint was almost as important as anaesthesia.

Nowadays, laparotomies are commonplace and the abdominal cavity of ruminants and swine can be opened with impunity, provided that sound surgical principles are followed. The increased application of anaesthesia of peripheral nerve trunks has expedited ruminant surgery greatly, while in the pig the barbiturates are of great value. The introduction of drugs capable of controlling wound sepsis has been of considerable help.

Important as these developments in farm animals undoubtedly are, there have been considerably greater advances in small-animal surgery, the most outstanding being intrathoracic surgery and the methods of open reduction and fixation of bone fractures. It can be said with truth that in this field, thanks to the work of a few enthusiasts, the veterinarian has followed closely the developments in human surgery.

The scope of veterinary surgery is determined by the indication for and the degree of application of the various surgical interferences on animals. The driving force in small-animal surgery is the sentimental attachment of the owner to his pet. This is a wholly laudable *raison d'être*, but occasionally requires to be tempered by the more profound considerations of the veterinarian. From time to time it is his prerogative to advise euthanasia rather than surgery on the grounds of humanity or genetic principles.

The motive behind the surgery of farm animals is entirely different and is based almost solely on economic considerations. Unless a farmer is convinced of a financial return accruing from a veterinary operation he will not be in favour of its adoption. Farm animals always command a salvage value, and this the farmer would often prefer, with subsequent replacement, rather than pay a costly veterinary bill. This thought, as to whether treatment is preferable to salvage, is constantly in the farmer's mind, and the answer is not constant but changes with alterations in market values. This is strikingly illustrated in the field of equine surgery, where the marked increase in the value of horse flesh has very much curtailed surgical interference. Nowadays it is quite likely that a farm horse with "fistulous withers" or "poll evil" will be butchered rather than operated on. Hence the opportunities for farm-animal surgery are directly proportional to the magnitude of the difference between the production value and the salvage value of the patient. In the years between the wars this difference was small, whereas in the war years it increased considerably and has remained high. Where pedigree is concerned the difference may be vast. As a result of this, farm animal surgery received a new impetus during the war and useful developments and more frequent applications have followed.

The human surgeon is concerned to preserve the life of his patient regardless of cost—or genetic consequences. He is governed by sentiment and the sanctity of human life. Some of his results would be unacceptable to the veterinary surgeon who requires that his recovered patients shall be productively fit and free from harmful genetic traits. Coupled with these extra-surgical considerations are certain intrinsic factors which reduce the scope of veterinary surgery compared with its human counterpart. Except in small animals, the veterinary surgeon is not greatly troubled by diseases of senility. Malignancy is far less common, many affections of the cardio-vascular and alimentary systems, some of which are occasioned by the stress of modern human life, do not occur in animals. Cosmetic surgery has little place in veterinary practice. Hence, even in small animals, the scope of surgery is always likely to be much less than in the human subject.

The status of veterinary surgery depends on the contribution it makes to the life of the community. In the narrower professional sphere it depends on the techniques it employs and the frequency of their application—and an awareness by the public of what it entails. Thus it is obvious that, although the education of the veterinary surgeon is strictly comparable to that of the doctor and the techniques he uses are similar, his status in this narrower sense, and therefore his remuneration, are lower.

A great difference between human and veterinary surgery is the surgical environment. Almost the whole of human surgery is carried out in the hospital or nursing home equipped with all the modern surgical accessories, including diagnostic aids, and performed by the surgical specialist working with his trained team of anaesthetist and assistants. The great bulk of veterinary surgery, on the other hand, is carried out on the several species in the animal environment. On the farm it is practised single-handed by the veterinary surgeon. Here the keyword is improvisation. The practitioner acts as his own anaesthetist and is responsible for everything. He cannot depend on any expert assistance being available. His chief lay assistant may faint in the middle of the operation. Nursing is done by the farm staff.

The small-animal surgeon can operate in more congenial surroundings. Most of the work is performed in his own clinic where the facilities and assistance may vary a good deal but are, at least, constant and familiar to the surgeon.

The overriding conclusion is that, by comparison, veterinary surgery suffers from a lack of facilities and of specialisation.

In considering the needs and future developments of veterinary surgery, I would draw attention to two main aspects. Firstly, its practice should be based on a sound foundation of economic necessity and sentimental fulfilment from which the veterinarian can claim adequate financial reward. Secondly, it will require facilities for its satisfactory application to the several species of animals.

As to the first point, the sentimental attachment of the British public to its domestic animals is traditional and likely to continue, so that the future of small-animal surgery seems to be secure. In this field it is the opportunity of the veterinarian to keep abreast of the advances which occur in human surgery and to apply them where practicable.

In farm animal surgery the outlook is less certain. Its successful practice depends on a healthy animal husbandry industry. This is influenced largely by economic policy which can vary with the political opinion of the Government of the day. Such decisions are outside the scope of the veterinary profession. However, with the prevailing world food scarcity, the increasing population and the raising of the living standards generally, demand for animal foodstuffs is likely to remain keen. Thus it is probable there will be a sustained demand for farm animal surgery.

As regards the satisfactory application of veterinary surgery, I believe there is need for a new approach to farm animal surgery. This is for specialisation and for a more expert service to be made available to the general practitioner.

That there is a need for animal hospitals in the countryside has been shown by the success of the field station hospitals which have been established by some of the teaching schools. As a result of some years' experience in such hospitals I have noted a readiness on the part of the owners of horses, particularly riding horses, and of cattle of high pedigree value to send patients, even over long distances, to these hospitals for surgical treatment. On the other hand, the ordinary commercial farmer is rather reluctant to send his surgical cases, particularly cattle, a long way from home. This I presume is due mainly to the total cost of transport, and of treatment and maintenance at the hospital. Trouble over movement of animals regulations, particularly in connection with the control of tuberculosis, and occasionally of foot-and-mouth disease, sometimes acts as a brake. On other occasions it is due to a lack of education of the owner and to the natural conservatism which abounds in the farmyard.

Thus although the provision of properly spaced rural hospitals would be a great step forward, something more will be required. I believe there is a need for surgical specialists to be more freely available for consultation with practitioners and for much of the surgical treatment to be performed by them on the farm. This could be met by an ambulatory unit based on the hospital, equipped with modern diagnostic aids and surgical accessories and staffed by a specialist surgical team with the object of doing the bulk of farm animal surgery, particularly that of cattle, on the farm. In this way, a considerable volume of farm animal surgery which is not now economical may be made available to the profession.

With the foregoing thoughts in mind the requirements of teaching may now be summarised. The success of veterinary surgical teaching depends on three main factors :

1. Teachers who are competent in the clinic as well as in the classroom.
2. A plentiful and constant flow of clinical material.
3. Proper numerical relationship between staff and students and between patients and students. The more these tend towards the optimum, the greater the likelihood of teaching becoming less formal and more practical.

Whereas surgical technique is likely to be learned mostly on small animals—and this raises no insuperable difficulties—there is a pressing need for greater contact in the schools between students and farm animal patients. This involves the provision of a field station hospital, with, as an unfortunate consequence, the division of clinical tuition between town and country. Opinions vary as to the best method of obtaining clinical material at the field station, but something more than a consultation service is required. A college practice, or ambulatory clinic, based on the hospital has many supporters. Additional to this, facilities for more detailed studies at a few nearby farms are a great advantage.

In so far as it relates to the day-to-day direction of clinical studies in a veterinary school, there is much in favour of combining Medicine and Surgery into one Clinical Department. But such an arrangement militates against specialisation and must therefore be regarded as a retrograde step. In addition, it would lead to a lowering of the status of clinical consultants.

The place of visual aids in the teaching of surgery has been discussed. There is fairly general agreement that the judicious use of epidiascope and lantern improves the quality of lectures and that the introduction of colour film strip "stills" is a useful innovation. Controversy centres around the value of the "movie" film as a means of demonstrating surgical techniques and operative procedures. A "film show" is a very poor substitute for a clinical demonstration and surgical technique can only be "learned by doing." Nevertheless, films have their advantages, and they are of tremendous and perpetual value for the accurate recording of clinical syndromes, especially of the less readily available affections. The onus, therefore, is on the teacher to use the film in its proper place and not as a substitute for live demonstrations, except where the real thing is unobtainable. The very essence of clinical teaching is contact of the student with the patient. It is probable that as our teaching facilities improve, there will be less enthusiasm for films.

Extramural "apprenticeship" with veterinary practitioners is at present an obligatory part of clinical instruction. In general, its results are salutary and it helps to widen the student's horizon. But it carries with it a large element of chance and, not infrequently, some danger. I look forward to the day when teaching facilities in the schools are so well developed that extramural clinical instruction will be optional. As a time for teaching himself, the vacation is especially valuable to the student and there is much educational scope for him beyond the precincts of veterinary science.

Legal Notes

Chicks held to be an "Article."—Whereas, as reported in our issue of December 20th, 1952, a goldfish was held by the West Ham Stipendiary Magistrate not to be an article within the meaning of the Public Health Act, the Chairman of the Gravesend Magistrates, in a case heard on May 20th, said that having regard to the intention of the statute and the interpretation placed on the word "article," that word could be held to cover chicks. Accordingly John Robert Collins, rag dealer, of Fairbank Street, East Road, N., was fined £3 for giving live chicks to a child under 14 in exchange for old clothes, the magistrates deciding that chicks were an article within the meaning of the section under which the prosecution was brought.

Prosecuting, Mr. D. F. Bunkall, deputy Town Clerk, said there was a similar case at West Ham where a man was summoned for exchanging goldfish for old clothes. The bench held that a goldfish was not an article within the meaning of the Act and dismissed the case. In his view that decision was not binding. The English language was not static and the meaning of many words had gradually altered. The modern meaning of the word "article" was any object or anything that could be handled, wether it was inanimate or not .

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Weekly Wisdom

We speak of medicine as both a science and an art, and surely these two aspects are complementary. Science is analytic, explaining, or seeking to explain, the whole in terms of the part : art is intuitive, and sees in the whole something more than can be explained as the sum of its parts.—Sir Russell Brain (Annual Oration delivered at the Medical Society of London, May 11th, 1953.)

ANIMALS I HAVE MET

THE SKUNK

BY

D. D. OGILVIE

An American friend has referred to the skunk as a pistol packin' pussy and I would not say that he was wrong. I met my first one in Uruguay as we drove homewards one evening along the camp road towards Montevideo. I did not see it, I smelt it. The malodorous vapour lay in a broad band over the highway and wafted in through the open windows. I looked in vain for evidence of a local gasworks, a sewage disposal centre, even a batch of dead cattle on the trail, which is not uncommon in Uruguay. But it was none of these. My companion laconically nodded his head and said only one word, " Skunk." We emerged from the smell band and were able to breathe again the clear sweet night air, but 10 minutes later the faint stench of skunk was still with us clinging fondly to our clothes and to the car. " Good job he wasn't near the road," said my friend, " Then we really would have been in the pong."

After that I became quite interested and I saw and smelt plenty of skunks in Uruguay and elsewhere. In most places I visited their numbers were small, but nevertheless they all succeeded in making their presence felt. Certainly I never found any difficulty in locating them when they were about.

Smells apart, and that says a lot when you are discussing skunks, this little animal has quite a personality of his own. In appearance, fortunately, he is quite distinctive. About the size of a cat, he gives the impression of being thick set and muscular, but this is mainly because he carries a heavy coat of fur, jet black in colour everywhere except for a white stripe running down over his head to the base of his tail. Despite the fact that he is a close relation of the weasel he gives the impression of being quite playful. Unlike the weasel he usually puts on a nonchalant air, with definitely no inferiority complex; none of the scuttling quick nervous movements of the weasel for him, but rather a swaggering insolence and waddling calm, even in the broad daylight. Short front legs keep his head low and his nose close to the ground, no doubt for very good reasons. But to the rear he is quite the reverse. His back legs are long and his hindquarters, set strategically high, are ready for instant action. Indeed his favourite shot is a quick swivel of the hips and a let go over the shoulder. Nature has made sure at least that he will not get it all in the eye!

Despite his smell, or much more likely, because of it, the skunk has got the reputation of being one of the most courageous of animals. He seems virtually to have no enemies. All of those you would expect to trouble him make a very wide detour around his area. But then he also has very few friends. At the very sight of him the boldest of creatures, the lion, the bear, the bull and all the rest quite shamelessly move off smartly in the opposite direction. Even the elephant never forgets! If you do chance to come across him it is wise to know the drill. If you walk towards him he will fix you sharply with a beady eye and very plainly indicate that it would be unwise for you to proceed further. You are left in no doubt that you are the one who should go and the sooner you do the better. If you are so rash as to disregard so fair a warning any hint of brotherly love will go out of his eye and he will watch you with the deadly caution of a gunman loosening his pistols from their holsters. He clearly says " One step forward and you'll have it."

In such a crisis it is soothing to appreciate that what is about to happen will improve your knowledge of ballistics, explosives, anatomy, and the many other bits and pieces of information which are necessary for making safe and successful visits abroad. From the ballistics viewpoint it has already been indicated that the skunk has no need to aim his business end at the target, since by swivelling like a war-time tail gunner he can fire rapidly in almost any direction. His explosive charge he keeps hidden in two zippered pouches cunningly placed near the base of his tail. He has an excellent repeater action if required, with enough ammunition for about half a dozen shots, and given a short pause, plenty more where that came from. He can play the tune in a variety of ways, a right barrel alone, or a left, or if he is in particularly good form, both together. He can shoot off in any direction from parallel to the ground to straight up in the air, and, no doubt having practised a lot, his aim is deadly. There is only one proviso, however. Like most of the better shots he is only really good when he can see what he is aiming at. If he has had a heavy night or for some other reason his vision is not all that it should be, he is apt to let go blindly, thereby scandalizing innocent passers-by and generally stinking up the neighbourhood. Indeed old skunks which cannot see straight are a positive menace to all, and by their blundering can be quite unpopular even among other skunks.

Above all, however, the skunk is a true sportsman and never shoots a sitter. When everything else has failed to flush his victim and he has made up his mind to fire he brings up his bushy tail and stamps his feet violently to give final warning. This is the time really to look up and if possible get out but when you have decided it is often much too late.

Apart from being a useful subject for instructive scientific notes like this you will doubtless wonder what use the skunk is and what can be done if he really does his worst to you. As everyone knows the skunk exists chiefly to provide collars for ladies' fur coats, and very good collars they are, but sometimes the ladies are a little apprehensive about the dangers of smell and then the furs are sold instead as some kind of sable, which makes everybody happy. With perfumes, of course, ladies are not nearly so difficult so the smell glands and their contents are used as a basis for these most expensive aids to glamour. Once upon a time skunk musk was used medicinally for the treatment of asthma—a kind of shock therapy no doubt—but this was soon discontinued. After even a short course most of the sufferers said that they would much prefer to have the disease, and there the matter rested.

Lots of advice can be given to the person on whom the skunk has scored a bull. Such advice, of course, is best given from a distance. The Americans, who are very skunk conscious, suggest the following. " Upon reaching home remove all clothing and bury at a depth of 6 feet. Bathe for two hours in a tubful of strong soap suds being sure thoroughly to wash the hair. Sprinkle the body with the contents of a bottle of toilet water and put on clean clothes —and you'll still stink to high heaven."

Personally I can see no point in being facetious about the skunk which by eating crickets, grasshoppers, mice, etc., is very much a friend of the farmer and certainly does more good than harm. I think it an interesting and even

(*Concluded at foot of col. 1, p. 355.*)

THE VETERINARY RECORD

May 30th, 1953.

VETERINARY SURGERY

THE broad-based survey of veterinary surgery which is presented elsewhere in this issue must have facets of interest to nearly every member of the profession. Despite the fact that the modern trend is to consider the clinical years of study as not being sharply divisible into two subjects as in the past, it is proper that from time to time attention should be paid to one or other of the main aspects of clinical veterinary science.

The practice of operative and manipulative surgery must always have a place in veterinary education. To many, operative surgery appeals strongly as being a part of professional life in which something concrete is achieved, the exercise of manual dexterity of itself giving pleasure and satisfaction to them. Fortunately, complete fission into medical and surgical specialisms has not taken place on any wide scale. It is improbable that the tendency to excessive specialisation, which has been the trend for many years in our sister profession of medicine and to which it is giving much cause for anxious thought, will invade the veterinary field. The very nature of practice, whether with large or small animals, demands that every surgeon shall be his own physician and possibly to a slightly less degree, the physician must at times be his own surgeon. Perhaps in this we are lucky.

As always, the teaching of veterinary surgery to the student is a subject for controversy. Of recent years the advent of the motion film has been an additional weapon in the teacher's armoury. There is yet no unanimity as to the value of this visual aid. We would ask whether it is always wise to show the carefully edited, smooth flowing film of a complicated technique—may this not cause the student sometimes to doubt his own abilities when he sees complex surgical procedures carried through rapidly and with none of the all-too-familiar snags which the experienced surgeon knows full well attend almost every operation, no matter how skilled the operator ?

The difficulty of affording the student adequate opportunity for practising surgical techniques is not yet overcome. The teacher, on the one hand, complains that the student shows little inclination to practise on cadavers ; the practitioner, on the other, will tell of students' constant demands for a " body " and for guidance in attempting simple techniques during periods of extra-mural tuition. The employer of new graduates frequently has cause to complain that the newly qualified are quite unfamiliar with the commonest of surgical techniques, which leads us to believe that a sound grounding in fundamental surgical principles, with frequent and prolonged attention to everyday techniques, will provide a better graduate than one brought up on films and demonstrations of the unusual and complex cases met but occasionally in normal practice.

The speakers on large- and small-animal surgery covered their own fields adequately and the summary throws into relief the different considerations applying to large- and small-animal surgical work. Surgical procedures for farm animals always will be limited most rigidly by economic factors and practicability. In the case of the horse, particularly thoroughbred and riding horses, there is a middle path, economic and practical considerations vieing with some degree of sentiment and the surgeon always being handicapped by the perils which assail the invader of the equine peritoneum. Finally, and here lies our greatest scope, there are the small animals in which sentiment is commonly the ruling factor, allowing far greater freedom to the surgeon who can offer reasonable expectation of life even in ageing subjects. Yet even here reason must prevail and it cannot be denied that operations of no little skill and magnitude, often comparing favourably with those of human surgery, are carried out daily at fees which are not commensurate with the service rendered. It is to the credit of the profession that this factor never limits the scope of surgical endeavour.

Experimental surgery has many fascinating paths to be pursued yet it finds small place in our teaching. Since so much physiological research entails highly specialised surgical technique it seems odd that so little advantage is taken of this for the student of surgery. Surely there is call for better liaison between the clinical and pre-clinical teachers here ?

For obvious reasons the surgeon in human medicine is technically in advance of his veterinary counterpart on account of the many attempts he must make to preserve or prolong life at any cost. Many surgical measures are adopted which would be ethically unacceptable to the average veterinary clinician, who aims at keeping alive only reasonably sound and healthy animals. Despite this, it is interesting to note that, on the occasions on which members of hospital theatre staffs have been present at veterinary operations, they have nearly always expressed surprise at and admiration for the standard of technique achieved. We might add that the post-operative course and freedom from adhesions of most of our major surgical cases seem to evoke some envy !

Veterinary surgery has made enormous progress in the last 20 years, a progress to which at present we see no end. So long as, in the pursuit of perfection of technical skill, we do not overlook the necessity for imbuing our graduates with the clinical touch and ability to diagnose, to assess fairly the merits of medical and surgical treatments available and to give to the owner a considered and honest prognosis of each case, we need not fear that surgery, that great and satisfying sphere of veterinary clinical work, will ever fail to do the profession credit.

unique animal, and find that many of the physiological problems it presents are quite puzzling even in this age of scientific progress. Its method of production of the liquid musk material, its quick and accurate assessment of distance without the provision of any range finding device, and its rapid differentiation of friend from foe—these and other problems are still unsolved. We can only conclude that the skunk very appropriately gets most of the answers by instinct.

LONDON CART HORSE PARADE

The magnificent weather for such an outdoor event and the special nature of the occasion—commemorated by the distribution of Coronation rosettes to entrants—ensured another fine popular success for this year's annual parade of cart horses in Regent's Park, for which there was an entry of 139, 12 fewer than last year. Two teams of four were entered and other competitors included 16 pairs and six barge horses. Entries were restricted to horses regularly worked in London during the past three months and prizes were awarded to drivers whose animals showed results of exceptionally good treatment and had harness that demonstrated "reasonable wear and superior cleanliness." Colour braided manes and tails, glittering brasses, and clean harness gave proof of the care bestowed; the parade included some splendid examples of most of the breeds of heavy horses, while new paint gave a gay appearance to the wagons and drays.

CLINICAL COMMUNICATION

THREE CASES OF THYROID TUMOUR IN DOGS

JOAN O. JOSHUA, F.R.C.V.S.,
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Cases of clinically recognisable tumours of the thyroid gland do not appear to be common in this country and for this reason the following reports may be of interest.

CASE 1. *Subject.*—Thirteen-year-old Wire Fox Terrier dog.

Presented with the history that it was restless at night and the owner suspected that it might be in pain. There had been difficulty in defaecating for three weeks, involving a good deal of straining. The owner had noticed a "lump in the throat."

On examination the dog was found to show evidence of general senile changes. Myocardial weakness and some pulmonary congestion were noted. The prostate was considerably enlarged and situated in the pelvis.

The lump in the throat proved to be a mass about the size of half a walnut situated ventral to the larynx; this was diagnosed as a thyroid tumour. It appeared to be causing no symptoms. No opportunity for surgical treatment occurred as euthanasia was requested and performed some three days later owing to deterioration in the general condition.

Histological examination confirmed the clinical diagnosis of tumour of the thyroid gland.

The tumour, which measured 4½ by 4 cm., was an adenoma of the thyroid gland, with a definite arrangement of tumour cells as cords or vesicles.

CASE 2. *Subject.*—Twelve-year-old cross-bred Bull Terrier dog.

In this case a swelling had been noticed in the neck for one year but there had been more rapid enlargement during the previous two weeks and the dog had shown some difficulty in swallowing, this act being followed by bouts of coughing.

The dog was in good condition and as the tumour apparently involved the right lobe of the gland only, it was decided to attempt surgical removal.

The dog was prepared for operation in the usual manner and was anaesthetised with nembutal intravenously. A midline incision over the area of the tumour was made, thus exposing the sterno-thyro-hyoideus muscles; these were separated at the median raphé by blunt dissection and an excellent exposure of the tumour was obtained. The blood vessels supplying the affected lobe were carefully ligated and the tumour was dissected off the underlying trachea. In this case the recurrent laryngeal nerve had become involved in the capsule and to some extent in the substance of the tumour and could not be easily separated from it; part of the nerve was therefore resected with the tumour mass.

The wound was closed in the usual manner and healing was by first intention.

Sequelae of the section of the recurrent laryngeal nerve were a change in the timbre of the bark and a degree of stridor which persisted for some six weeks. All interference with deglutition disappeared.

There was no recurrence of the tumour either at the site or as metastases and the dog lived a normal life for some 10 months post-operatively when the development of cardiac disease caused the owner to request euthanasia.

The tumour, which measured 8½ by 4½ cm., was examined histologically, and found to be an adenoma of the thyroid gland. The polygonal or elongated or columnar epithelial cells formed small vesicles, double columns, solid acinar sheets, or irregular cords, supported by a fine stroma.

CASE 3. *Subject.*—Five-year-old Golden Retriever dog.

This dog had been losing weight for several weeks and although bright had been tiring easily. Had had several "black-outs" which were probably heart attacks.

On examination the dog was found to have a normal temperature; it was grossly emaciated and the face and head presented a drawn, haggard appearance. The pulse was full and bounding and very irregular. The heart appeared to be completely disorganised and was incredibly arrhythmic.

A mass, about the size of a lemon, was detected low in the neck on the left side and dropped down nearly to the point of the sternum.

Diagnosis.—Thyrotoxicosis due to a thyroxine-producing tumour of the left lobe of the thyroid gland.

Treatment.—Owing to the severe cardiac disturbance immediate surgery could not be contemplated and a digitalis, pot. brom. and chloral hydrate mixture was prescribed. This resulted in greatly improved heart rhythm and three days later thiouracil (1½ gr. *t.i.d*) was prescribed. For four days the dog improved greatly in general condition but thereafter relapsed and did not respond further to thiouracil or methyl thiouracil which was substituted later. The heart action remained steady, however, and operation was decided upon.

Weight at time of operation 49 lb.

Anaesthesia was by intravenous nembutal and the dog was prepared for operation in the usual way. Technique was as previously described, this tumour also being well encapsulated but extremely hard and vascular.

The blood vessels supplying and draining the gland were of an alarming calibre, about the thickness of lead pencils, and despite most careful double ligaturing grave doubts were felt as to the effectiveness of haemostasis. The tumour mass was separated from the trachea and the wound closed in the usual manner.

Within a few hours of operation considerable congestion occurred at the operation site, the area becoming intensely painful and the overlying skin severely bruised. This condition slowly subsided over the following five days and despite being profoundly shocked the dog made a good recovery. Three days post-operatively temperature was normal, the dog was in excellent spirits and the heart and pulse were regular.

Ten days after operation sutures were removed, the wound having healed by first intention.

Weight was now 56 lb., a gain of 7 lb. in 10 days. Three weeks later the dog scaled 60 lb., which is estimated to be its normal weight.

To date, 14 months after operation, the dog has remained perfectly normal in every way, with no evidence of recurrence.

The tumour, which measured 5 by 3 cm., was an adenoma of the thyroid gland, in which there was some ossification of the stroma.

REMARKS

The interest of these three cases lies in the different clinical pictures presented. In one no symptoms could be attributed to the tumour, in the second symptoms were of a mechanical nature with no signs of thyrotoxicosis, whilst

ANNOTATION

THE DEGREE AND DURATION OF IMMUNITY FOLLOWING THE USE OF S.19 *BR. ABORTUS* VACCINE IN CATTLE

Although vaccination with S.19 has been practised widely throughout the world for several years, little is yet known regarding the precise duration of immunity conferred by this vaccine despite the fact that such information must play a vital part in the control and eventual elimination of brucellosis. Recently, Stableforth (1952) reviewed our present knowledge pertaining to this subject in a paper given to a FAO/WHO meeting in Vienna and he stressed the fact that the information we possess is still far from adequate. Certainly the degree of resistance in the first pregnancy following upon vaccination has been assessed with reasonable accuracy and the safety and usefulness of S.19 under experimental and field conditions is now well established, but so far the resistance of vaccinated animals to *Br. abortus* in their second and subsequent pregnancies has not been thoroughly investigated. Until recently, the lack of adequate isolation accommodation in this country and elsewhere in which to conduct well-controlled large-scale experiments in cattle has prevented progress in this direction. It should, perhaps, be stressed that to determine the duration of immunity resulting from vaccination alone the experimental animals must be kept in an environment completely free from *Br. abortus* infection apart from the eventual introduction of experimental infection. The determination of duration of immunity in the field is, of course, an entirely different proposition. In experiments already completed at different centres, widely divergent techniques, especially with reference to the infecting strain of *Br. abortus* and the actual weight of the challenge dose, have led to considerable difficulty in comparing and assessing the significance of results. Under field conditions the duration of immunity to brucellosis as a result of vaccination in infected herds is almost impossible to assess. The superimposed initial infection of the animals following upon vaccination may well stimulate a degree of immunity far in excess of that produced by vaccination alone and as the disease is brought under control on the farm so does this opportunity to acquire infection wane. Thus there is no real test of the actual immunity subsequently existing in the herd. To some extent this might help to explain the good results reported by Wight (1942) in the U.S.A., Buddle (1949) in New Zealand and Lawson (1950) in Great Britain. All these authors emphasised the fact that no reduction of immunity was recorded in later pregnancies. Working under experimental conditions Delez (1940) believed that immunity might have waned slightly by the second pregnancy but that it would still be adequate to protect against most field exposures. In subsequent experiments in the U.S.A. divergent views have been expressed by Beach, Irwin & Berman (1947), Birch, Gilman & Stone (1945) and Manthei, Mingle & Carter (1951). The first two groups of workers reported a low degree of protection in the third and fourth pregnancies respectively, while Manthei and his co-workers declared that no decrease in immunity occurred and further postulated that the age factor might well have played an important part in the apparent increased resistance of their experiment animals. Still more recently at the second meeting of the FAO/WHO expert brucellosis committee at Florence in 1952, the report of which has not yet been published,* some evidence was presented to show that animals vaccinated as calves and in which there had been no opportunity to acquire an increase in immunity by subsequent contact with *Br. abortus*, were still resistant even at the fifth pregnancy. This evidence was based mainly on the work of Manthei *et al.* (1951) referred to above.

This would suggest that more than one vaccination in calfhood is unnecessary but this opinion must be viewed with caution when one considers the good results obtained by calfhood vaccination in infected herds where the possibility of exposure of the animals to further infection cannot be excluded.

In Britain, controlled experimentation in cattle with S.19 was initiated by the Brucellosis Committee of the Agricultural Research Council. This work was conducted in special isolation units at Compton using cattle of known history. These experiments have shown the high immunising value of S.19 when injected into non-pregnant heifers and the complete safety of this vaccine with regard to excretion in the milk of vaccinated cattle. (Edwards, McDiarmid, de Ropp & McLeod, 1946.) Moreover, by serial passage in the pregnant cow this strain has been carefully checked for the possibility of mutation by Taylor & McDiarmid (1949), who confirmed the previous findings of Mingle, Manthei & Jasmin (1941) that S.19 was stable in character. The usefulness of this vaccine for the immunisation of pregnant cows in a recently infected herd in order to prevent the further spread of the disease has also been established (McDiarmid, 1950). Consequently the logical procedure following upon these experiments was to attempt to determine the duration of immunity conferred in calves by vaccination, in different ways, with S.19. In the present experiments at Compton vaccination of older stock has been avoided because of the subsequent depression of milk yield (Holman & McDiarmid, 1945) and the undesirable persistence of agglutinins following vaccination of adult animals. In view of the American work and the divergent results so obtained, the same infecting strain (McEwen strain 544) has been used throughout with a challenge dose always comparable to that used in previous experiments in this country. Thus, continuity is maintained and comparison is made possible between different groups of animals and different experiments. A plan of the present experiment in progress at Compton is shown below and it will be observed that the 534 animals have been allocated to five main groups, a number from each group being exposed to the standard test dose during each pregnancy. In this way it is hoped eventually to determine the exact duration of immunity following one, two and three vaccinations in calfhood. This experiment commenced in 1949 and is due to terminate in 1956; results following exposure of some of the experimental cattle to the standard test dose in their first pregnancy have been disappointing—the level of protection being somewhat lower than the accepted high level

* We are grateful to Dr. Kesteven and Dr. Kaplan, the Joint Secretaries of the FAO/WHO Expert Committee on Brucellosis, for permission to publish this information.

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the third presented a classical picture of severe thyrotoxicosis in a relatively young dog.

Acknowledgment.—I am indebted to Mr. E. Cotchin, of the Royal Veterinary College, for undertaking histological examination of these tumours and furnishing the reports incorporated in this article.

of about 80 per cent. in past experiments. It is hoped, however, that this will not interfere unduly with the determination of the eventual duration of immunity. The results following the exposure of cattle in their second pregnancy are, so far, not yet complete and therefore it will be some time before details can be made available. It should be emphasised that the challenge dose used in these experiments is 10 times that which causes most controls to abort and infects nearly all of them; that is to say, it is much greater than any dose to which animals are likely to be exposed under natural circumstances.

EXPERIMENT TO COMPARE THE DEGREE AND DURATION OF IMMUNITY IN CATTLE FOLLOWING SINGLE AND MULTIPLE VACCINATIONS WITH S.19

Groups	Age at vaccination	Numbers of cattle to be tested at each pregnancy							
		1st	2nd	3rd	4th	5th	6th	Spares	Total
1	6 months	10	10	20	20	20	20	5	105
2	18 months	10	10	20	20	20	20	5	105
3	6 and 12 months	10	10	10	20	20	20	15	105
4	6, 12 and 18 months	10	10	10	20	20	20	15	105
5	*Controls*								
	Fellows to those in groups 1 to 4	5	5	10	10	10	10	7	57
	Compton cattle	5	5	10	10	10	10	7	57
									534

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A. MCDIARMID.

ABSTRACTS

Research on Muscle Relaxants in Dogs*

Suxethonium and succinylcholine are short-acting relaxants which have been adopted for use in human surgery. It has been observed, however, that in dogs these compounds have a much more profound action than in man and that they produce relaxation over a much longer period and also apnoea.

In an attempt to discover the reason for this variation in action in man and dog, experiments were carried out on several dogs which were anaesthetised by techniques commonly employed in human anaesthesia and the relaxants were administered and their effects noted.

It has previously been discovered that the duration of action of succinylcholine is dependent upon the amount of pseudo-cholinesterase in the plasma. Accordingly, in the experimental dogs this was administered and the effects observed. This substance did, indeed, cut short the action of succinylcholine and of suxethonium.

The results are discussed in the light of existing knowledge. That it is too soon to theorise is the theme of an editorial on succinylcholine in the same issue of the *B.M.J.* In man, however, the serum pseudo-cholinesterase is not significantly more abundant than in dogs, as one might expect from the foregoing data, though the true cholinesterase in dogs is only about one-seventh of that in man. This substance is concerned with the relaxing action of succinylcholine and not with its inactivation. Clearly the problem requires further investigation.

J. E.

* * * * *

Glanders: A New Method of Curative Treatment*

A method which is claimed to be the first effective curative treatment for glanders has been evolved by the Veterinary Department of the Persian Army in which a few years ago the morbidity rate from glanders was 12 per cent.

The new treatment consists of the combined administration of either mallein or a formalised vaccine of the glanders bacillus and a sulphapyrimidine.

Four hundred horses either with clinical glanders or merely reactors to the mallein test were treated with the vaccine called "Anamorve" and with sulphadiazine in respective dosage for 30 days of 5 c.c. subcutaneously daily and five doses of 5 grammes daily. It is claimed that 96 per cent. of the horses were cured and rendered negative to the mallein test after variable periods of time.

In a smaller series of cases, mallein was used instead of "Anamorve" and sulphamezathine instead of sulphadiazine. Sulphamezathine was given in the same dosage as sulphadiazine and mallein was given in a progressively increasing concentration, beginning with 5 c.c. of a 1:1,000 solution on the first day; of a 1:900 solution on the second day; 1:800 solution on the third day, and so on till the 19th day's dose was of a 1:10 solution. During the last 10 days a 20 per cent. solution was given. Results with this treatment were the same as those with the first method. The number of horses treated by the latter method is not given but the authors, in their conclusion, state their preference for it.

Records are given of results of mallein tests carried out for 18 months after the beginning of treatment for glanders in 11 horses. They show a gradual diminution in the sensitivity to mallein and finally the loss of sensitivity in most of the cases.

J. E.

* **Response in Dogs to Relaxants Derived from Succinic Acid and Choline.** HALL, L. W., LEHMANN, H., & SILK, E. (1953). *Brit. Med. J.* i. 134.

* **Combined "Anamorve" Sulphadiazine and Mallein-Sulphamezathine Treatments for Equine Glanders.** FATHI, R., BARAFROUKHTE, A., CHARIF, Y., & FEKRAT, M. (1952). *Arch. Inst. Hessarek.* **7.** 22.

QUESTIONS IN PARLIAMENT

Atmospheric Pollution (Fluorine)

Dr. Stross (May 19) asked the Parliamentary Secretary to the Ministry of Works, as representing the Lord President of the Council, whether he has noted that the experimental evidence now available, showing prolonged intake of fluorine compounds, causes chronic kidney disease in animals, before bone changes occur; and whether he will institute an investigation of the neighbourhood hazards of industrial fluorosis in Stoke-on-Trent, so as to estimate the danger to human beings.

The Parliamentary Secretary to the Ministry of Works (Mr. Hugh Molson): I am aware that in one investigation large doses of sodium fluoride administered in the diet to rats for more than 10 months produced changes in the kidneys. This is a very different matter from exposure to minute proportions of fluorine in the atmosphere and I know of no new evidence which would suggest that further research on human fluorosis should be undertaken in Stoke-on-Trent. As my hon. Friend the Parliamentary Secretary to the Ministry of Health indicated in her speech on the Adjournment on Thursday last, the problem of pollution of the atmosphere with fluorides will no doubt be within the terms of reference of the committee on air pollution which the Government propose to set up.

Dr. Stross: Does not the Parliamentary Secretary see that the evidence existing is that fluorine compounds are being used more and more in industry generally and that there is an increasing hazard to human beings? Would he at least say whether the experiment to which I have referred and which he has quoted is checked to see if it be accurate?

Mr. Molson: There is at present no evidence that the gravity of fluoride poisoning in the case of human beings is sufficient to warrant a detailed investigation by the Medical Research Council. As the hon. Member is aware, in the case of animals the danger of fluoride poisoning is very much greater than in the case of human beings.

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Swine Fever (Crystal Violet Vaccine)

Sir L. Ropner (May 21st) asked the Minister of Agriculture whether he will introduce a scheme with the object of ensuring a more extensive use of swine fever crystal violet vaccine.

Mr. Nugent: The possibility of introducing such a scheme is under discussion with the British Veterinary Association and the National Farmers' Union. Considerable progress has been made and my right hon. Friend hopes that a satisfactory plan will be devised.

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Anthrax

Sir L. Ropner (May 21st) asked the Minister of Agriculture if he has yet come to any decision about the sterilisation of imported bone meal and bones with a view to minimising the danger of anthrax.

Mr. Nugent: No. Discussions with the trade associations concerned have now taken place and my right hon. Friend is considering the matter in the light of their comments.

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Cattle Disease (Hypomagnesaemia)

Mr. J. Morrison (May 22nd) asked the Minister of Agriculture if he is in a position to give any information in regard to the progress of research into the cattle disease known as hypomagnesaemia.

Sir T. Dugdale: Research into the causes of hypomagnesaemia (lactation tetany) is being carried out at the Moredun and Hannah Research Institutes, the National Institute for Research in Dairying and the Royal (Dick) School of Veterinary Studies, and at the Ministry's Veterinary Laboratory at Weybridge. No very conclusive results have been obtained so far, and research into the disease is continuing.

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Pigs (Slaughtering)

Mr. Baker (May 22nd) asked the Minister of Food if he will take urgent steps to improve the collection and distribution of pigs for slaughter.

Major Lloyd George: I am always ready to examine any particular difficulty that has arisen in the collection and delivery of pigs for slaughter, and I am considering certain points to which my hon. Friend has drawn my attention.

NOTES AND NEWS

Diary of Events

May 30th.—Annual General Meeting of the Society of Women Veterinary Surgeons, at the Royal Veterinary College, N.W.1, 2.30 p.m.

June 5th.—Special Meeting of the North Wales Division, B.V.A., at Ruthin (Council Chambers), 2 p.m.

June 6th.—Meeting of the Scottish Branch, B.V.A., at Glasgow University Veterinary School, 2.30 p.m.

June 10th.—Summer Meeting of the Southern Counties Division, B.V.A., at Winchester. (See Notice.)

June 10th.—Meeting of Editorial Executive, B.V.A., 2.30 p.m.

June 11th.—Annual General Meeting of the Society of Practising Veterinary Surgeons, at Birmingham (The Grand Hotel), 12 noon.

June 11th.—Annual General Meeting of the National Veterinary Benevolent and Mutual Defence Society at Manchester (Midland Hotel), 2.30 p.m.

June 12th.—Meeting of the South Wales Division, B.V.A., at Aberystwyth, commencing at 11.30 a.m. (See Notice).

June 12th.—Annual General Meeting of the R.A.V.C. Division, B.V.A., in London (Room 350, The War Office, Main Building), 2.30 p.m.

June 12th.—Annual Dinner of the R.A.V.C. Officers' Club, at Grosvenor House, London.

June 18th.—Summer Meeting of the Section of Comparative Medicine, Royal Society of Medicine, at the Wellcome Research Laboratories, Langley Court, Beckenham, Kent, 2 p.m.

June 19th.—Annual General Meeting of the Association of Veterinary Teachers and Research Workers (Scottish Regional Group) in the University of Glasgow Veterinary School, 2 p.m.

June 20th.—Meeting of the Biochemical Society in the Department of Biochemistry, University of Oxford, South Parks Road, Oxford, 11 a.m.

B.V.A. Technical Development Committee Two-day Meeting

Wednesday, June 24th
2.30 p.m., Technical Development Committee at 36, Gordon Square, London, W.C.1.

Thursday, June 25th
10.30 a.m., Technical Development Committee at 36, Gordon Square, London, W.C.1.

July Meetings of B.V.A. Council and Committees
At 36, Gordon Square, London, W.C.1

Wednesday, July 29th, 1953.
11 a.m., Organising Committee.
2.15 p.m., Home Appointments Committee.
4 p.m., Parliamentary and Public Relations Committee.

Thursday, July 30th, 1953.
10.30 a.m., Veterinary State Medicine Committee.
1.30 p.m., Finance Sub-committee.
2 p.m., General Purposes and Finance Committee.

At the Connaught Rooms, Great Queen Street, W.C.2

Friday, July 31st, 1953.
11 a.m., Council meeting.

Aug. 9th—15th.—XVth International Veterinary Congress, Stockholm, Sweden.

Sept. 6th—12th.—Seventy-first Annual General Meeting and Congress of the British Veterinary Association, at Aberdeen.

R.C.V.S. Examinations

Thursday, June 4th.—D.V.S.M. Written Examination commences at Edinburgh (2 p.m.).
Monday, June 8th.—D.V.S.M. Orals and Practicals.
Thursday, June 25th.—M.R.C.V.S. Written Examinations.
Friday, June 26th.—Ditto.

PERSONAL

Births.—Hamilton-Dick.—On May 21st, 1953, at the Garrett Anderson Maternity Hospital, Hampstead, to Laurene (*née* Clemo), wife of Captain G. Hamilton-Dick, R.A.V.C., of 12, Silver Lane, Purley, a son—David Frederick George.

Harries.—On May 9th, 1953, to Melville (*née* Davies) and G. Michael Harries, M.R.C.V.S., of Maerdy, Portfield, Haverfordwest, a daughter—Annette Elizabeth.

Malone.—On May 17th, 1953, at Tudor Lodge, Newry, to Margaret, wife of Gerald S. R. Malone, B.Sc., M.R.C.V.S., a daughter.

Sinclair.—On May 14th, 1953, to Hazel, wife of Keith Sinclair, of Aberystwyth, a son—Robert Neil.

Watson.—On May 19th, 1953, in Gloucester, to Dr. Barbara Watson (*née* Leach), wife of David Anthony Watson, B.A., M.R.C.V.S., of 18, Denmark Road, Gloucester, a daughter, Sally Ann.

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Marriage.—Markham—Readings.—The marriage took place between A. E. G. Markham, B.Sc., M.R.C.V.S., and Joyce E. Readings, late member of R.C.V.S. staff, at Iringa, Tanganyika, on May 16th, 1953.

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R.C.V.S. OBITUARY

Moffett, Arthur James, M.R.C.V.S., of 68, Witherford Way, Selly Oak, Birmingham, 29, and late of Well Park, Galway, Eire. Graduated London, 1896. Served in First War 1917-1918 in Army Veterinary Corps. Died May 20th, 1953; aged 81 years.

Townsend, Clarence Henry Southgate, C.B.E., M.C., T.D., F.R.C.V.S., Colonel R.A.V.C. (retd.), of South Farm, Southrop Lechlade, Glos. Graduated London, August 25th, 1914; Fellowship, November 23rd, 1926. Died May 25th, 1953; aged 58 years.

Colonel Townsend's Death While Playing Polo

We record above with the deepest regret the death of Colonel C. H. S. Townsend, renowned far beyond his county of Gloucestershire as a hunting devotee and an all-round sportsman. Colonel Townsend collapsed and died while playing polo at Cirencester Park on the afternoon of Whit-Monday. Friends said he had complained of feeling unwell just before the match. He was playing for Southrop against Wanborough in the semi-final of the Cirencester Town Cup competition. Play continued after an interval, but the presentation of trophies was cancelled.

A fuller tribute will appear in an early issue.

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Bovine Tuberculosis in Ireland

Comment on B.V.A. President's Address

Mr. A. M. Graham, M.R.C.V.S., President, British Veterinary Association and Superintending Veterinary Officer of the British Ministry of Agriculture, visited Dublin on May 7th to address the quarterly general meeting of the Veterinary Medical Association of Ireland in the Veterinary College, Ballsbridge, on "Control of Some of the Major Diseases of Animals."

Having informed his hearers that the British Government was satisfied that until an effective anti-foot-and-mouth disease vaccine had been developed, the stamping out by slaughter method was the only way of dealing with the disease in their country, and he considered the same applied to Ireland, Mr. Graham passed to the problem of control of tuberculosis in cattle, which, he said, was one which greatly concerned Ireland. In Britain an effort to control it was being made by encouraging farmers to establish accredited tuberculosis-free herds. Mr. Graham described the scheme in detail.

In its issue of May 12th, the *Irish Times* commented upon this aspect of the address as follows: "It lays stress on a British policy which in a short space of time can make a grave difference to the Irish livestock trade. . . . Irish livestock is, and for some time past has been, free from foot-and-mouth disease, swine fever and anthrax—three diseases that continue to beset the animal population of Great Britain. On the other hand, the British authorities have gone much further towards the elimination of tuberculosis from their country's herds. No less than 40 per cent. of the cattle across the Channel—3,700,000 head—belong to areas scheduled as 'accredited.' These are areas in which approximately two-thirds of the animals are clear of tuberculosis: when the area has once been accredited an untested animal may not be moved into it or out of it. The effect upon Ireland is evident. The system means that Irish beasts which do not possess a clean bill in respect of tuberculosis are denied admission to 40 per cent. of British farms, and the prevailing hope of the B.V.A. is that there will be none at all except accredited herds within 10 years. That means a poor look-out for our store cattle trade unless we take drastic steps ourselves to eliminate bovine tuberculosis. Why a serious scheme has not been undertaken already is hard to understand. The Irish veterinary profession has often advocated a plan for the eradication of tuberculosis, but it has found no favour with successive Governments. Not only the export trade is at stake; unhealthy milk and meat spell danger to our human population. Herein significant figures are furnished by the latest annual report (for 1951) of the Chief Veterinary Inspector for the Dublin Corporation. The total number of cattle slaughtered at the Dublin abattoir in that year amounted to 65,774. Out of that number 1,154 were wholly condemned and parts of other animals were condemned to the extent of 8,155 lb. Other alarming figures—not, however, readily intelligible to the layman—relate to the condemnations in private slaughterhouses. The loss in actual cash from cattle slaughtered in Dublin would seem to amount to anything between £70,000 and £100,000 per annum—a sum which, added to the loss throughout the rest of the 26 counties—is surely great enough to justify the price of an eradication scheme. One cannot estimate how enormously greater the loss to the national purse will be if the British authorities succeed in their ambition to render their herds tuberculosis-free, and thereby deny admission to all Irish cattle that fail to pass the test. Let it be granted that we have opened new markets for Irish meat, both dead and 'on the hoof.' The fact remains that, unless a revolutionary change occurs in this nation's economy, its prosperity must be dependent for a very long time upon the British market; and, if the value of that market is seriously impaired, the consequences will be calamitous."

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Ear-marking Scheme for Cattle

The Ministry of Agriculture announces the introduction of a uniform ear-marking scheme for cattle. Under the rules of the Tuberculosis (Attested Herds) Scheme, cattle in attested and supervised herds must be marked for identification purposes in a manner approved by the Minister of Agriculture and Fisheries. Up to the present any system by which each animal in a herd had a different mark has been accepted. The progress of tuberculosis eradication now makes it desirable not only that marking should identify each animal in a particular herd but also that the mark allotted to any individual animal should not be duplicated in any other attested or supervised herd. For this reason, therefore, it has been decided to introduce a uniform system of marking for all attested herds, supervised herds and herds in tuberculosis eradication areas and attested areas. Accordingly, after consultation with the Departments of Agriculture and Health for Scotland, and with the National Farmers' Unions and other interests, the Ministry of Agriculture and Fisheries has introduced an ear-marking scheme for cattle in such herds and, on a voluntary basis, for cattle in other herds. As the area eradication plan for tuberculosis develops, more and more herds will become subject to official marking requirements, and the scheme will thus apply to an ever-increasing proportion of herds in the country.

Briefly, the scheme provides for the allotment by the Ministry's Divisional Veterinary Officer of a herd mark for each herd covered by the scheme. The herd mark will be a letter-number combination, allocated on a county basis. It will be tattooed in the *right* ear of each animal in the herd and below it a serial number identifying each individual animal. The herd owner will be responsible for the marking of his animals, but may, of course, arrange for the marking to be done on his behalf, for example, by his veterinary surgeon.

The scheme does not apply to pedigree cattle marked or otherwise identifiable in accordance with the rules of a breed society, and does not involve any change for owners of herds in Scotland who are already using an officially recommended system of marking. Furthermore, a herd owner who already has in use a system which he is anxious to retain may apply to the Divisional Veterinary Officer for approval of the continued use of the system. Provision is also made for permission to be given in special circumstances, *e.g.*, in the case of stores for fattening or of small herds, for the use of ear-tags in lieu of tattooing, provided that the method of tagging is satisfactory.

A copy of the scheme (obtainable on application to Information Room, Ministry of Agriculture, 3, Whitehall Place, S.W.1) is being sent to all owners of attested herds and supervised herds, together with a notice stating the herd mark allotted to them. The new system of marking will apply to all calves born in the

herd after the date of the notice, and to animals added to the herd which are not already marked in the right ear.

As there are now over 100,000 attested herds and some 3,000 supervised herds, it may take some little time to notify all owners. In the meantime no action on their part is necessary.

An important feature of the scheme is that it is open, on a voluntary basis, to owners of herds which are not attested or supervised or kept in a tuberculosis eradication area or attested area. The Ministry's Divisional Veterinary Officer will allot a herd mark on request to any applicant whose herd is being tested, or about to be tested, with a view to qualifying for entry to the Attested Herds Scheme. The herd owner will thus be able to use an approved mark at an early stage.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

ANTHRAX:

Somerset.—Loves Hill Farm, Timsbury, Bath (May 16).

Warwicks.—Grange Farm, Thurlaston, Rugby (May 18).

Yorks.—Red House Farm, Gargrave, Skipton; Fowler Hill Farm, Silsden, Keighley (May 18).

FOWL PEST:

Beds.—Westley's Field, Wilden, Bedford (May 15).

Bucks.—Meadow View, Lower Chippenham Lane, Slough (May 18).

Hants.—118, Fernhill Road and Martin's Folly, Sandy Lane, Cove, Farnborough (May 16).

Surrey.—The Orchard, King's Road, Walton-on-Thames (May 16).

SWINE FEVER:

Beds.—39, Whitfield Avenue, Leagrave, Luton (May 20).

Bucks.—24, Mount Pleasant, Apsley Guise (May 19); Home Farm, Foscote, Buckingham (May 20).

Cambs.—Fincham Farm, Stonea, March (May 19).

Ches.—New Farm, Tilston Road, Malpas; Church Farm, Great Sutton, Wirral (May 18); Newton Holbows, Newton Kingsley (May 19); Watermeetings Farm, Romiley, Stockport (May 20).

Cornwall.—Calenick, Kea, Truro (May 19).

Denbighs.—Plas yu Clawdd Farm, Johnstown, Nr. Bala (May 19).

Devon.—Webworthy Farm, North Petherwin, Nr. Launceston (May 20).

Essex—Mayer's Farm, Sandon, Chelmsford; Bellcumber Hall, Finchingfield (May 18); 42, Front Lane, Cranborne; 160, Southend Road, Stanford-le-Hope (May 19).

Flints.—Bodengan, Waen, St. Asaph (May 18).

Glos.—Glasshouse Villa, Mayhill, Longhope (May 18); Barnwood House Farm, Barnwood; The Laurels, Whitecourt, Wey (May 19).

Hants.—1, Bull's Farm, King's Worthy, Winchester (May 18).

Hereford.—Green Lane Farm, Letton, Eardisley (May 18); Jubilee House, Bartestree, Hereford (May 20).

Herts.—Hillside Farm, Redricks Lane, Sawbridgeworth (May 20).

Lancs.—Low Farm Cottages, Healing Road, Stallingborough, Grimsby; South Road, North Somercotes, Louth; Homestead, Theddlethorpe, Mablethorpe (May 18); Valley Farm, Bardsley, Ashton-under-Lyne; Prescott, Haigh Road, Aspull (May 19); The Arches Piggeries, Clayton Bridge, Failsworth (May 20).

Lincs.—Fortescue Farm, Tattershall (May 19).

Merioneth.—Talybout Farm, Rhyduchap, Nr. Bala (May 19).

Middlesex.—Rosebanks Farm, The Ridgeway, Mill Hill, N.7 (May 20).

Montgomery.—Pwll-y-Glo, Moel-y-Garth, Guilsfield (May 20).

Norfolk.—Laurel Farm, Deopham, Wymondham; Grove Farm, Carleton Road, Norwich; Furze Farm, Winfarthing, Diss; Houchen's Farm, Felthorpe, Norwich (May 18); Hindolverstone Road, Guestwick (May 19); Old Garden Piggeries, Whittington, Thetford; Brook House, Brook, Norwich; Heather House Farm, Hickling, Norwich; 29, Leys Lane, Attleborough (May 20).

Northants.—Roe Farm, Cogenhoe, Northampton: No. 3 Cottage, Cold Higham, Towcester; Crockwell Farm, Welton, Daventry; Avenue Farm, Rushden (May 19)

Notts.—Sties at Tolney Lane, Newark (May 18).

Salop.—Park Hall Farm, Galeowen (May 19); Lower House Farm, Alberbury (May 20).

Shropshire.—Brynyplantyn, Middleton, Oswestry (May 18).

Somerset.—Wayside, Bourton, Weston-super-Mare (May 18); Hill Farm, Walton, Street (May 20).

Staffs.—175, Harvills Hawthorne, Hill Top, West Bromwich; Sties at Andressey Hospital, Belvedere Road, Burton-on-Trent (May 18); Plardwick Farm, Grosall (May 20).

Suffolk.—Box Tree Farm, Wetherden, Stowmarket; Butterfly Farm, Great Finborough (May 19); Swiss Farm, Otley, Ipswich; Prentice Lane, Woodbridge; Hall Farm, Stoke Ash, Eye; "White Horse" Public House (May 20).

Warwicks.—Home Farm Buildings, Cherrington, Shipston-on-Stour (May 19); Stean's Farm, Bennett's Road, Corley, Coventry (May 20).

Wilts.—Fisherton Fields, Salisbury (May 18).

Yorks.—Welburn, York; Lower Stonehead Farm, Cowling, Keighley; 24, Brown Lane Allotments, Leeds (May 18); Jock's Lodge, Bentley, Doncaster (May 19); East Newland Farm, Riccall; Shayfield House, Hainworth, Keighley (May 20).

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ESSEX VETERINARY SOCIETY

At a meeting of Essex Veterinary Surgeons, held at the Essex Institute of Agriculture, Writtle, on May 12th, a resolution was passed in favour of the formation of an Essex Veterinary Society, with the ultimate object of recognition as a division of the B.V.A. Mr. W. T. MacGregor, M.R.C.V.S. was elected President of the Society, and Mr. Roger Massey, M.R.C.V.S., 11, Widford Road, Chelmsford, Hon. Secretary and Treasurer. It is hoped to hold the first meeting of this new Society early in June; meanwhile, Mr. Massey would be pleased to hear from any member in Essex who has not already joined.

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The Royal Sanitary Institute, in collaboration with the Ministry of Agriculture and Fisheries (Infestation Control Division), has organised a rodent control exhibition, open to the general public, now being held in the Institute's Museum of Hygiene, 90, Buckingham Palace Road, S.W.1, to June 20th (Monday to Friday, 10 a.m. to 5 p.m.; Saturday, 10 a.m. to noon).

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Erratum.—"Pregnancy Toxaemia in Grassland Flocks" (J. R. Holmes). *Vet. Rec.* **65.** 299: under the heading "Aetiology," line 9, *for* "19th month of gestation" *read* "19th week of gestation."

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Fowl Pest	Sheep Scab	Swine Fever
16th to 30th April, 1953	24	1	18	—	238
Corresponding period in—1952	39	43	8	—	49
1951	26	—	6	—	32
1950	17	—	9	—	1
1st January to 30th April, 1953 ...	350	25	210	—	1,018
Corresponding period in—1952	174	115	100	1	398
1951	194	17	457	4	280
1950	155	12	69	19	2

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at April 30th, 1953, was as follows:—

England	Wales	Scotland	Total (Great Britain)
49,229	27,454	24,856	101,539

B.V.A. ANNUAL CONGRESS IN ABERDEEN

SEPTEMBER 6th to 12th, 1953

Provisional Programme

N.B.—All meetings will take place in the Music Hall unless otherwise stated.

SUNDAY, SEPTEMBER 6th

8.00 p.m.
" At Home," given by the North of Scotland Division, B.V.A., at the Caledonian Hotel.

MONDAY, SEPTEMBER 7th

10.00 a.m.
Civic Welcome by the Hon. the Lord Provost of Aberdeen (Rev. Professor John M. Graham, M.A.), followed by Opening of Congress by the Lady Tweedsmuir, M.P.

10.30 a.m.
Opening of Exhibition of Surgical Instruments, Drugs, etc., by the President, B.V.A.

2.30 p.m.
Paper : " Recent Advances at Weybridge," by Dr. A. W. Stableforth, M.R.C.V.S., D.V.S.M., Director, Ministry of Agriculture Veterinary Laboratory, Weybridge.
Opener : Mr. D. L. Hughes, M.R.C.V.S., DIP. BACT.
Chairman : Professor A. Robertson, M.A., PH.D., B.SC., M.R.C.V.S., F.R.I.C., F.R.S.E.
Recording Secretary : Mr. L. G. Donald, B.SC., M.R.C.V.S.

8.00 p.m.
Civic Reception and Dance, given by the Lord Provost and Corporation of the City of Aberdeen in the Beach Ballroom.

TUESDAY, SEPTEMBER 8th

10.00 a.m.
Paper : " Pig Housing and its Relation to Health," by Mr. D. S. Soutar, A.R.I.B.A., A.A. DIP., A.R.I.A.S., Farm Buildings Department, North of Scotland College of Agriculture.
Openers : Mr. D. F. Oliver, B.SC., M.R.C.V.S., and another.
Chairman : Mr. H. M. Wilson, M.R.C.V.S.
Recording Secretary : Mr. M. Maclellan, M.R.C.V.S.

10.15 a.m.
Ladies' Guild Annual General Meeting.

2.30 p.m.
Demonstration (Methods of Pig Housing) at Craibstone Farm and elsewhere, arranged by Mr. D. S. Soutar, A.R.I.B.A., A.A. DIP., A.R.I.A.S.

2.30 p.m.
Ladies' Excursion, to Paradise Woods and Alford.

8.30 p.m.
Ladies' Guild Dance at Northern Hotel.

WEDNESDAY, SEPTEMBER 9th

10.00 a.m.
Paper : " Veterinary Application of Antibiotics and other Modern Therapeutic Substances with Special Reference to Those Not in Common Use in the United Kingdom." (Author and Opener to be announced later.)
Chairman : Mr. W. J. B. Robson, J.P., M.R.C.V.S., D.V.S.M.
Recording Secretary : Mr. G. A. M. Sharman, M.R.C.V.S.

12 noon
Meeting of 1952–53 Council, B.V.A.

1.00 p.m.
Glasgow Veterinary School Alumnus Association Annual General Meeting and Lunch, Caledonian Hotel.

2.30 p.m.
Congress photograph.

3.30 p.m.
Annual General Meeting, B.V.A.

7.00 for 7.30 p.m.
Annual Banquet at Northern Hotel.

THURSDAY, SEPTEMBER 10th

10.00 a.m.
Paper : " Some Aspects of Veterinary Dermatology," by Mr. S. Jennings, M.R.C.V.S., University of Glasgow Veterinary Hospital.
Opener : Mr. E. F. Lewis, M.R.C.V.S.
Chairman : Mr. A. J. MacLennan, B.SC., M.R.C.V.S.
Recording Secretary : Mr. James A. Brown, M.R.C.V.S.

1.45 p.m.
Congress Excursion to Deeside.
Golf Competition, Bowling, etc.

6.00 for 6.30 p.m.
Royal Dick Alumnus Association Annual General Meeting and Dinner : Northern Hotel.

From 8.30 p.m.
Informal Social Evening, with some entertainment, at the Northern Hotel.

FRIDAY, SEPTEMBER 11th

10.00 a.m.
A Symposium of Short Papers :—
(*a*) Dr. J. G. Campbell, F.R.C.V.S. " Some Aspects of Research Work at the Poultry Research Centre, Edinburgh."
(*b*) Mr. J. A. Crichton, M.B.E., M.A., B.SC. " Experiments with Identical Twin Calves."
(*c*) Dr. K. L. Blaxter. " Muscular Dystrophy."
(*d*) Dr. W. S. Gordon, C.B.E., M.R.C.V.S., F.R.S.E., and Mr. J. H. Taylor, M.R.C.V.S. " Antibiotics in Animal Feeding-stuffs."
Chairman : Mr. A. Thomson, M.R.C.V.S.
Recording Secretary : Mr. J. Suttie, M.R.C.V.S.

2.30 p.m.
Visit to Rowett Research Institute by permission of Dr. D. P. Cuthbertson, F.R.S.E. (Director), and Dr. A. T. Phillipson, M.A., M.R.C.V.S. (Deputy Director).
Demonstration at V.I.O. Laboratory at North of Scotland College of Agriculture, arranged by Mr. P. L. Shanks, B.SC., M.R.C.V.S.
Films.

8.30 p.m.
President's Reception and Dance at the Northern Hotel.

SATURDAY, SEPTEMBER 12th

10.00 a.m.
Closing Meeting of Congress, followed by First Meeting of 1953–54 Council.